User Manual

EDANUSA

SE-3

Electrocardiograph

Release 21

CE 0123

About this Manual

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Statement

This manual will help you understand the operation and maintenance of the product better. It is reminded that the product shall be used strictly complying with this manual. User's operation failing to comply with this manual may result in malfunction or accident for which EDAN INSTRUMENTS, INC. (hereinafter called EDAN) can not be held liable.

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Responsibility of the Manufacturer

EDAN only considers itself responsible for any effect on safety, reliability and performance of the equipment if:

Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by EDAN, and

The electrical installation of the relevant room complies with national standards, and

The instrument is used in accordance with the instructions for use.

Upon request, EDAN may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which EDAN may define as user serviceable.

Terms Used in this Manual

This guide is designed to give key concepts on safety precautions.

WARNING

A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

CAUTION

A **CAUTION** label advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.

NOTE

A **NOTE** provides useful information regarding a function or a procedure.

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Chapter 1 Safety Guidance

This chapter provides important safety information related to the use of the 3-Channel Electrocardiograph.

1.1 Intended Use

The intended use of the 3-Channel Electrocardiograph is to acquire ECG signals from adult and pediatric patients through body surface ECG electrodes. The electrocardiograph is intended to be used only in hospitals or healthcare facilities by doctors and trained healthcare professionals. The cardiogram recorded by the 3-Channel Electrocardiograph can help users to analyze and diagnose heart disease. However the ECG with measurements and interpretive statements is offered to clinicians on an advisory basis only.

1.2 Warnings and Cautions

In order to use the electrocardiograph safely and effectively, and avoid possible dangers caused by improper operations, please read through the user manual and be sure to be familiar with all functions of the equipment and proper operation procedures before use.

Please pay more attention to the following warning and caution information.

NOTE:

1. This device is not intended for home use.
2. The pictures and interfaces in this manual are for reference only.

1.2.1 Safety Warnings

WARNING

1. The electrocardiograph is provided for the use of qualified physicians or personnel professionally trained. They should be familiar with the contents of this user manual before operation.
2. Only qualified service engineers can install this equipment, and only service engineers authorized by the manufacturer can open the shell.

WARNING

3. Only qualified installation or service engineers can shift the mains supply shift switch (100V-115V~/220V-240V~) according to local mains supply specifications.
4. The results given by the equipment should be examined based on the overall clinical condition of the patient, and it can not substitute for regular checking.
5. This device is not intended for treatment or monitoring.
6. The EQUIPMENT is protected against malfunction caused by electrosurgery according to the clause 36.202.101 in the IEC60601-2-25.
7. Electrodes of dissimilar metals should not be used; it may cause a high polarization voltage.
8. **EXPLOSION HAZARD** - Do not use the electrocardiograph in the presence of flammable anesthetic mixture with oxygen or other flammable agents.
9. **SHOCK HAZARD** - The power receptacle must be a hospital grade grounded outlet. Never try to adapt the three-prong plug to fit a two-slot outlet.
10. If the integrity of the external protective conductor is in doubt, the equipment should be operated by using the built-in rechargeable battery.
11. Do not use this equipment in the presence of high static electricity or high voltage equipment which may generate sparks.
12. This equipment is not designed for direct cardiac application.
13. Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.
14. Make sure that all electrodes are connected to the patient correctly before operation.
15. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrode, do not come into contact with earth or any other conducting objects.
16. Electrodes with defibrillator protection should be used while defibrillating. To avoid a polarization or DC offset voltage, use non-polarizing electrodes(which will not form a DC offset voltage when subjected to a DC current) such as silver/silver-chloride types if there is a situation where there is a likelihood that a defibrillation procedure will be necessary.

WARNING

17. There is no danger for patients with pacemakers. However, if a pacemaker is used, the results given by the equipment may be invalid, or lose the clinical significance.
18. Do not touch the patient, bed, table or the equipment while using the ECG together with a defibrillator.
19. In order to avoid being burned, please keep the electrodes far away from the radio knife while using electrosurgical equipment.
20. If reusable electrodes with electrode gel are used during defibrillation, ECG recovery will take more than 10 seconds. The manufacturer recommends the use of disposable electrodes at all times.
21. Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.
22. The summation of leakage current should never exceed leakage current limits while several other units are used at the same time; otherwise, electric shock may happen.
23. The potential equalization conductor can be connected to that of other equipment when necessary, to make sure that all these devices are connected to the potential equalization bus bar of the electrical installation.
24. If the wireless AP technology is used, in order to maintain compliance with the FCC RF exposure guidelines, the wireless AP should be installed and operated with a minimum distance of 20cm between the radiator and the human body. Use the supplied antenna only. There should be no shield in or around the room where the wireless AP is used.
25. Fix attention on the examination to avoid missing important ECG waves.
26. The disposable electrodes can only be used for one time.
27. We recommend that the electrocardiograph should be working on AC power supply at least 8 hours per month to avoid DATE&TIME missing.

1.2.2 Lithium Battery Care Warnings

WARNING

1. Improper operation may cause the lithium battery (hereinafter called battery) to be hot, ignited or exploded, and it may lead to the declination of the battery capacity. It is necessary to read the user manual carefully and pay more attention to warning messages.
2. Only qualified service engineer authorized by the manufacturer can open the battery compartment and replace the battery. The battery of the same model and specification provided by the manufacturer should be used.
3. Danger of explosion -- Do not reverse the anode and the cathode when installing the battery.
4. Do not heat or splash the battery or throw it into fire or water.
5. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
6. The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal. Batteries are hazardous waste. Do NOT dispose of them together with house-hold garbage. At the end of their lives hand the batteries over to the applicable collection points for the recycling of waste batteries. For more detailed information about recycling of this product or the battery, please contact your local Civic Office, or the shop where you purchased the product.
7. Remove the battery from the electrocardiograph when the electrocardiograph is not used for a long time.
8. If the battery is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.

1.2.3 General Cautions

CAUTION

1. Federal (U.S.) law restricts this device to sale by or on the order of a physician.
2. Avoid liquid splash and excessive temperature. The temperature must be kept between 5 ºC and 40 ºC during operation, and it should be kept between -20 ºC and 55 ºC during transportation and storage.
3. Do not use the equipment in a dusty environment with bad ventilation or in the presence of corrosive.
4. Make sure that there is no intense electromagnetic interference source around the equipment, such as radio transmitters, mobile phones etc. Attention: large medical electrical equipment such as electrosurgical equipment, radiological equipment and magnetic resonance imaging equipment is likely to bring electromagnetic interference.
5. Before use, the equipment, the patient cable and electrodes etc. should be checked. Replacement should be taken if there is any evident defectiveness or aging symptom which may impair the safety or the performance.
6. The following safety checks should be performed at least every 24 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.
   a) Inspect the equipment and accessories for mechanical and functional damage.
   b) Inspect the safety related labels for legibility.
   c) Inspect the fuse to verify compliance with rated current and breaking characteristics.
   d) Verify the device functions properly as described in the instructions for use.
   e) Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1ohm.
   f) Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500 μA, SFC 1000μA.
   g) Test the enclosure leakage current according to IEC/EN 60601-1: Limit: NC 100μA, SFC 500μA.

CAUTION

h) Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

i) Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

j) Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50μA (CF).

The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the above tests, the device has to be repaired.

7. Ruptured fuse must only be replaced with that of the same type and rating as the original.

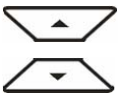
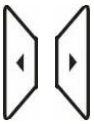
1.2.4 Cleaning & Disinfection Cautions

CAUTION

1. Turn off the power before cleaning and disinfection. If the mains supply is used, the power cord should be dragged out of the outlet. Prevent the detergent from seeping into the equipment during cleaning.
2. Do not immerse the unit or the patient cable into liquid under any circumstances.
3. Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.
4. Any remainder of detergent should be removed from the unit and the patient cable after cleaning.
5. Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

1.3 List of Symbols

	External output
	External input
	Equipment or part of CF type with defibrillator proof
	Caution
	Consult Instructions for Use
	Potential equalization
	Mains supply
	On (mains supply)
	Off (mains supply)
	Battery indicator
	Battery recharging indicator
	Sensitivity switch key
	Recall key

	1mV calibration key& Copy key
	Mode/RST switch key
	Lead switch key
	ON/OFF key
	Menu key
	Up arrow/Down arrow key
	Left arrow/ Right arrow key
	Print/Stop key
	Recycle
P/N	Part Number
SN	Serial Number
	Date of Manufacture
	Manufacturer
EC REP	Authorized Representative in the European Community

CE 0123	The symbol indicates that the device complies with the European Council Directive 93/42/EEC concerning medical devices.
	It indicates that the device should be sent to the special agencies according to local regulations for separate collection after its useful life
Rx only (U.S.)	Federal (U.S.) law restricts this device to sale by or on the order of a physician

Chapter 2 Introduction

SE-3 3-channel electrocardiograph gathers ECG signals of 12 leads simultaneously. It displays the operation menu, ECG parameters as well as electrocardiograms.

3-channel ECG waves can be viewed on the LCD screen and printed out by using a high-quality thermal recorder.

The auto, manual, rhythm, USB print and off modes can be chosen freely.

SE-3 can be powered by the mains supply or a built-in rechargeable lithium battery. Basic type and Net type are optional for each model, only the Net type electrocardiograph can support network transmission function. The DE12 ECG board is optional for all the models. With the DE12 ECG board, SE-3 can support full-scale pacemaker detection function.

With a high resolution thermal recorder, a 32-bit processor and a large-capacity memorizer, SE-3 has advanced performance and high reliability. The compact size makes it suitable for clinic, hospital and ambulance use.

Configuration: main unit, power cord, earth wire, patient cable, electrodes, thermal recorder paper, fuses and lithium battery

WARNING

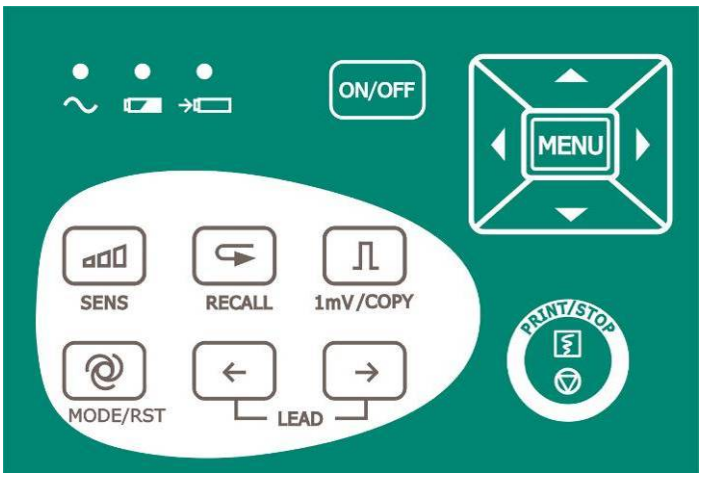
1. This equipment is intended for use on adult and pediatric patients only.
2. This equipment is not designed for direct cardiac application.
3. The results given by the equipment should be examined based on the overall clinical condition of the patient, and it can not substitute for regular checking.

2.1 Top Panel

Figure 2-1 SE-3 (320×240 dot single color LCD screen, hereinafter called SE-3 Wide screen)

Figure 2-2 SE-3 (192×64 dot single color LCD screen, hereinafter called SE-3 Narrow screen)

2.2 Control Panel and Keys



SE-3 Control Panel and Keys

1) Indicator Lamp

~	Mains supply indicator lamp: when the device is powered by the mains supply, the lamp will be lit.
	Battery indicator lamp: when the device is powered by a built-in rechargeable lithium battery, the lamp will be lit.
	Battery recharging indicator lamp: when the battery is being recharged, this lamp will be lit.

2) Sensitivity Switch Key

The sensitivity switch order: ×10 mm/mV → ×20 mm/mV → AGC (Auto Gain Control) → ×2.5 mm/mV → ×5 mm/mV.

3) Recall Key

Press the **RECALL** key to open the recall window. For details, see chapter 7, “Managing ECG Records”.

4) 1mV/COPY Key

In the **Manual** mode, press this key to print a 1mV calibration mark while printing ECG reports.

In the **AUTO** mode, once the hint information *COPY* appears on the LCD screen, pressing the **1mV/Copy** key can print the ECG report which was printed out last time.

5) MODE/RST Key

Press this key to select a printing mode among **AUTO**, **MANUAL**, **RHYTHM**, **USBPRT** and **OFF**.

The switch order of lead groups in each mode is listed in Table 2-1.

In the **MANUAL** mode, press this key to reset the waveform quickly while printing ECG reports.

WARNING

When using the device with a defibrillator, after the defibrillator discharges, you should press the **MODE/RST** key to reset the waveform quickly.

Note: The detailed information of the automatic mode can be set on the system setup interface.

Table 2-1 Switch Order of Lead Groups in Different Modes

Mode	Switch Order (from Left to Right)			
AUTO(Standard)	I/II/III	aVR/aVL/aVF	V1/V2/V3	V4/V5/V6
AUTO(Cabrera)	aVL/ I /-aVR	II /aVF/ III	V1/V2/V3	V4/V5/V6
MANUAL	In this mode, you need to press the Lead switch key to change the lead groups, the lead switch order can be that of AUTO (Standard) or AUTO (Cabrera), which is determined by settings of lead sequence and printing format on the system setup interface.			

6) LEAD Switch Key

In the **MANUAL** mode, press this key to switch the lead groups.

For SE-3 Narrow screen, press this key to switch to the prev or next page of the system setup interface, or press this key to switch to the prev or next page of records in the recall window.

7) PRINT/STOP Key

Press this key to begin or stop printing ECG reports.

8) ON/OFF Key

Press this key to turn on or off the device.

9) MENU Key

Press this key to open the system setup interface.

10) Up Arrow/Down Arrow Key

Press the Up or Down arrow to select an item on the main interface and the system setup interface.

11) Left Arrow/ Right Arrow Key

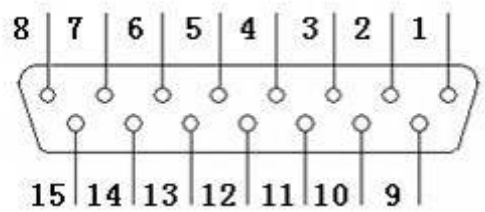
Press the Left or Right arrow to set the selected item.

2.3 Patient Cable Socket and Signal Interface

As Figure 2-1 and Figure 2-2 show, on the right side of the main unit are the patient cable socket, the RS232 socket, the external input/output socket and the USB interface.

The net port (optional, only for Net type) is on the back of the main unit shown in the following figure. Only the electrocardiograph with net port can support network transmission function.

1) Patient Cable Socket



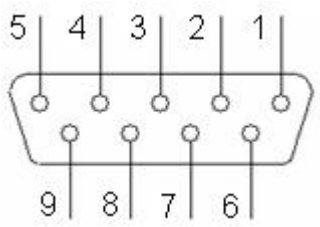
: Applied part of type CF with defibrillator proof

: Caution

Definitions of corresponding pins:

Pin	Signal	Pin	Signal	Pin	Signal
1	C2 (input)	**6**	SH	**11**	F (input)
2	C3 (input)	**7**	NC	**12**	C1(input)/ NC
3	C4 (input)	**8**	NC	**13**	C1(input)
4	C5 (input)	**9**	R (input)	**14**	RF (or called N) (input)/ NC
5	C6 (input)	**10**	L (input)	**15**	RF (or called N) (input)

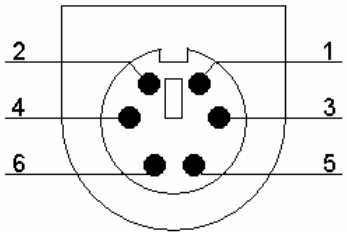
2) RS232 Socket



Definitions of corresponding pins:

Pin	Signal	Pin	Signal	Pin	Signal
1	NC	**4**	NC	**7**	NC
2	RxD (input)	**5**	GND	**8**	NC
3	TxD (output)	**6**	NC	**9**	NC

3) External Input/Output Socket



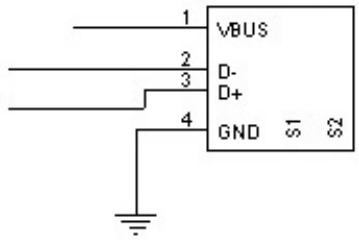
Definitions of corresponding pins:

Pin	Signal	Pin	Signal
1	GND	**4**	GND
2	GND	**5**	ECG Signal (input)
3	GND	**6**	ECG Signal (output)

4) USB Interface

WARNING

Only the USB equipment recommended by the manufacturer can be connected to the USB interface.



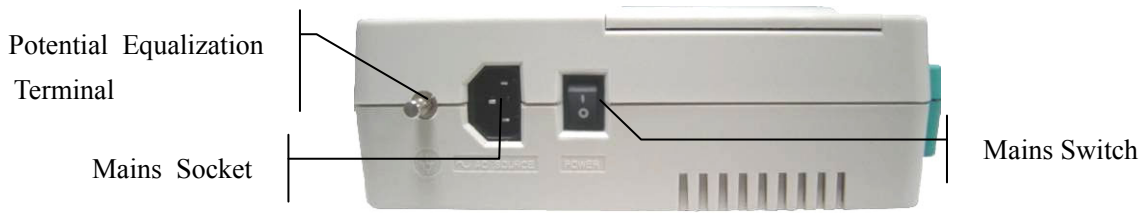
Definitions of corresponding pins:

Pin	Signal	Pin	Signal
1	VBUS	**3**	D+
2	D-	**4**	GND

WARNING

1. Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.
2. The summation of leakage current should never exceed the leakage current limit while several other units are used at the same time.

2.4 Mains Connection and Switch



1) Potential Equalization Terminal

The potential equalization conductor provides a connection between the unit and the potential equalization bus bar of the electrical installation.

2) Mains Socket

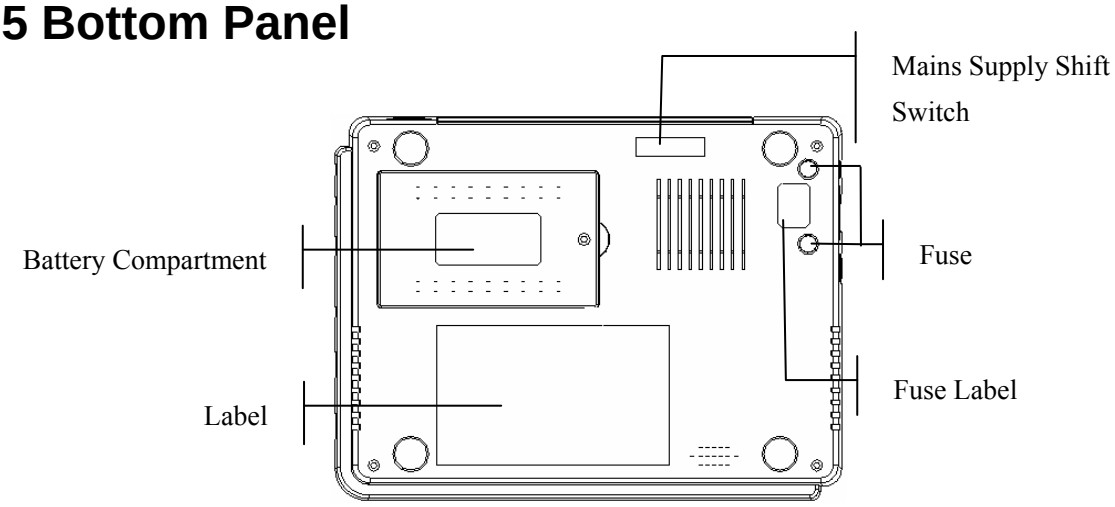
AC SOURCE: alternating current supply socket

3) Mains Switch

| : On

○ : Off

2.5 Bottom Panel



1) Battery Compartment

The battery label indicates the rated voltage and the rated capacity of the rechargeable lithium battery.

Rated voltage: 14.8V, Rated capacity: 2200mAh.

⚠ Caution

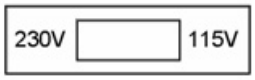
WARNING

1. Improper operation may cause the battery to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. Therefore, it is necessary to read the user manual carefully and pay more attention to warning messages.

WARNING

2. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
3. Only qualified service engineer authorized by the manufacturer can open the battery compartment and replace the battery. The battery of the same model and specification provided by the manufacturer must be used.

2) Mains Supply Shift Switch



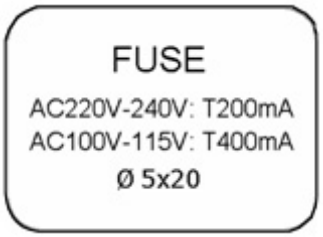
Mains supply with rated input voltage 230V (220-240V) or 115V (100-115V) can be chosen by using the shift switch according to local mains supply specifications.

WARNING

Only qualified installation or service engineer can shift the mains supply shift switch according to local mains supply specifications.

3) Fuse

There are two fuses of the same specifications installed on the bottom of the main unit. The specifications are shown on the fuse label: 220V-240V: T200mA; 100V -115V: T400mA; Φ5×20.



WARNING

Ruptured fuses must only be replaced with those of the same type and rating as the original.

2.6 Features

- Low weight and compact size
- High resolution thermal recorder, recording frequency response ≤150Hz
- ECG signals of 12 leads are gathered and amplified simultaneously, 3-channel waves are displayed and recorded simultaneously
- The auto, manual, rhythm, USB print and off modes are optional
- Measurement function and interpretation function are optional
- System setup interface for parameter settings
- Built-in rechargeable lithium battery with large capacity
- Hint information for lead off, lack of paper, low battery capacity etc.
- Automatic adjustment of baseline for optimal printing
- Standard input/output interface and RS232 communication interface
- ECG data can be transmitted to the PC software through the serial cable, net cable (optional, only for net type), or wireless AP (optional).

Chapter 3 About SE-3 Application Interface

The following sections provide an overview of the main functions in the SE-3 application. After you turn on the device, the main interface pops up. Then you can press the **MENU** key to open the system setup interface. Or press the **RECALL** key to open the recall window.

3.1 About the Main Interface (SE-3 Wide Screen)

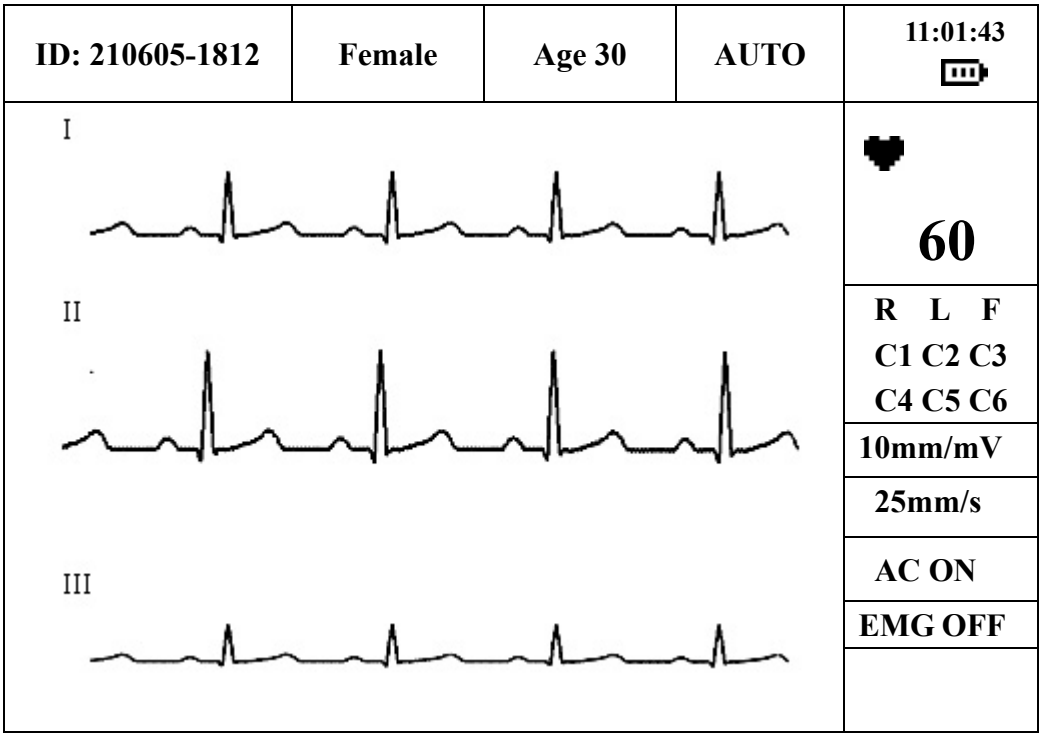


Figure 3-1 Main Interface (SE-3 Wide Screen)

The main interface includes:

Top Row (from left to right)**:**

- Patient ID(generated automatically according to the examination date and time)
- Sex (**Male**/**Female**)
- Age
- Printing mode(**AUTO**, **MANUAL**, **RHYTHM**, **USBPRT** or **OFF**)
- Current time and the battery capacity symbol (The battery capacity symbol appears only when the built-in battery is used.)

Right Row (from top to bottom)**:**

- Heart rate ♥
- Electrode identifiers (The highlighted electrode identifiers show the status of Lead Off, which means electrodes fall off the patient or the patient cable falls off the unit.)
- Sensitivity (**2.5mm/mV**, **5mm/mV**, **10mm/mV**, **20mm/mV**, **AGC**)
- Printing speed (**5mm/s**, **6.25mm/s**, **10mm/s**, **12.5mm/s**, **25mm/s**, **50mm/s**)
- AC filter (**AC ON**, **AC OFF**)
- EMG filter (**EMG OFF**, **EMG 25Hz**, **EMG 35Hz**, **EMG 45Hz**)
- Hint information (*Paper?*, *Printing*, *Sampling*, *Bat Weak* etc.)

Press the Up or Down arrow to select the ID, sex, age, speed, AC filter or EMG filter item, and then press the Left or Right arrow to set the selected item.

Press the **MODE/RST** key to select a printing mode among **AUTO**, **MANUAL**, **RHYTHM**, **USBPRT** and **OFF**.

Press the **SENS** key to switch the sensitivity.

Note: When modifying the printing mode or the sensitivity on the main interface, you should press **MENU** twice to save these modifications to the system. After that, you will see these modifications on the main interface when you turn on the electrocardiograph next time.

3.2 About the Main Interface (SE-3 Narrow Screen)

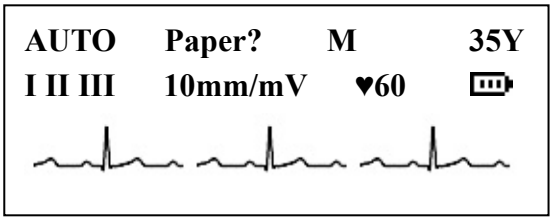


Figure 3-2 Main Interface (SE-3 Narrow Screen)

The main interface:

First Row (from left to right)**:**

- Printing mode(**AUTO**, **MANUAL**, **RHYTHM**, **USBPRT** or **OFF**)
- Hint information (*Paper?*, *Printing*, *Sampling*, *Bat Weak* etc.)
- Sex (**Male**/**Female**)
- Age

Second Row (from left to right)**:**

- Current sampling lead group
- Sensitivity (**2.5mm/mV**, **5mm/mV**, **10mm/mV**, **20mm/m**V, **AGC**)
- Heart rate
- Battery capacity symbol (The battery capacity symbol appears only when the built-in battery is used.)

Third Row:

- ECG waves

Press the Up or Down arrow to select the sex or age item, and then press the Left or Right arrow to set the selected item.

Press the **MODE/RST** key to select a printing mode among **AUTO**, **MANUAL**, **RHYTHM**, **USBPRT** and **OFF**.

Press the **SENS** key to switch the sensitivity.

Note: When modifying the printing mode or the sensitivity on the main interface, you should press **MENU** twice to save these modifications to the system. After that, you will see these modifications on the main interface when you turn on the electrocardiograph next time.

3.3 About the System Setup Interface

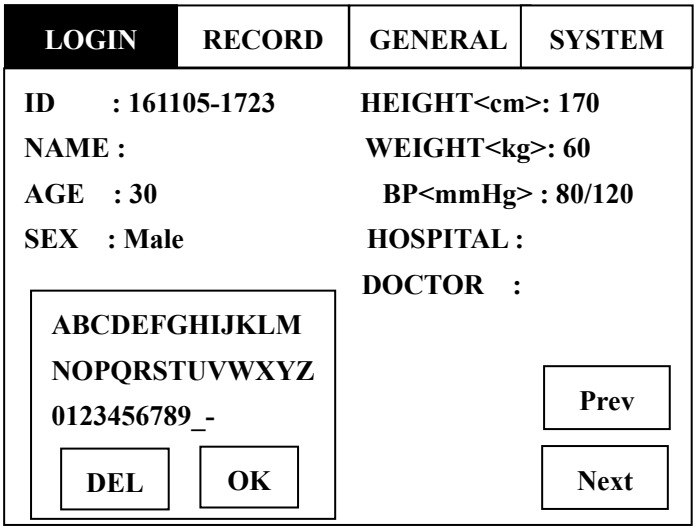


Figure 3-3 System Setup Interface (SE-3 Wide Screen)

There are four tabs on the system setup interface of SE-3 Wide screen: **LOGIN**, **RECORD**, **GENERAL** and **SYSTEM**.

Press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to switch among these tabs.

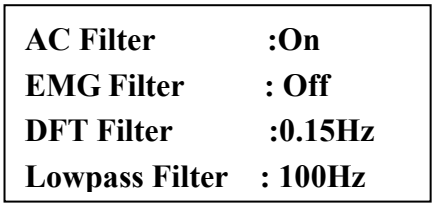


Figure 3-4 System Setup Interface (SE-3 Narrow screen)

Press the Lead switch key to switch to the prev or next page of the system setup interface.

Press the Up or Down arrow to select an item, and then press the Left or Right arrow to set the selected item.

Press the **MENU** key again to exit the system setup interface.

3.4 About the Recall Window

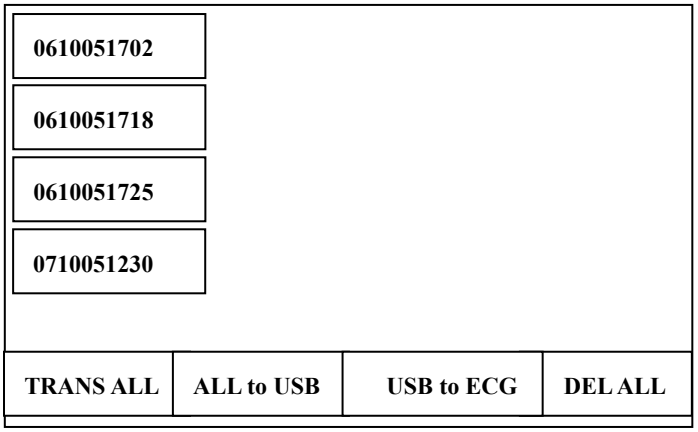


Figure 3-5 Recall Window (a) (SE-3 Wide screen)

Press the Up or Down arrow to select the **TRANS ALL** button, and then press the **MENU** or **PRINT/STOP** key to transmit all the patient records to the PC.

Press the Up or Down arrow to select the **ALL to USB** button, and then press the **MENU** or **PRINT/STOP** key to transmit all the patient records to the U disk.

Press the Up or Down arrow to select the **USB to ECG** button, and then press the **MENU** or **PRINT/STOP** key to transmit the patient records in the U disk to the electrocardiograph.

Press the Up or Down arrow to select the **DEL ALL** button, and then press the **MENU** or **PRINT/STOP** key to delete all the patient records.

Press the Up, Down, Left or Right arrow to select a patient record, and then press the **MENU** or **PRINT/STOP** key to open the recall window (b).

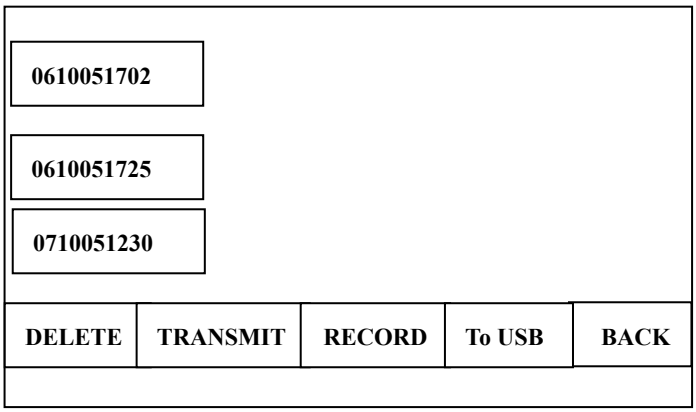


Figure 3-6 Recall Window (b) (SE-3 Wide screen)

Press the Up or Down arrow to select the **DELETE** button, and then press the **MENU** or **PRINT/STOP** key to delete the patient record.

Press the Up or Down arrow to select the **TRANSMIT** button, and then press the **MENU** or **PRINT/STOP** key to transmit the patient record to the PC.

Press the Up or Down arrow to select the **TO USB** button, and then press the **MENU** or **PRINT/STOP** key to transmit the patient record to the U disk.

Press the Up or Down arrow to select the **RECORD** button, and then press the **MENU** or **PRINT/STOP** key to print out the patient record.

Press the Up or Down arrow to select the **BACK** button, and then press the **MENU** or **PRINT/STOP** key to return to the recall window (a).

Press the **RECALL** key again to return to the main interface.

For SE-3 Narrow screen, press the Lead switch key to switch to the prev or next page of records in the recall window. Press the Left or Right arrow to switch among the **TRANS ALL**, **ALL to USB**, **USB to ECG**, **DEL ALL**, **DELETE**, **TRANSMIT**, **TO USB**, and **RECORD** buttons.

For details on managing patient records, please refer to chapter 7, “Managing ECG Records”.

Chapter 4 Operation Preparations

WARNING

Before use, the equipment, the patient cable and electrodes should be checked. Replace them if there is any evident defectiveness or aging which may impair the safety or the performance. Make sure that the equipment is in proper working condition.

4.1 Power and Earthing

WARNING

If the integrity of the external protective conductor is in doubt, the equipment should be powered by the built-in rechargeable lithium battery.

Power Supply

The electrocardiograph can be powered either by the mains supply or a built-in rechargeable lithium battery.

- **Mains supply**

  The mains socket is on the left side of the unit. If the mains supply is used, connect the power cord to the socket first, and then connect the power cord to the hospital grade outlet.

Operating voltage:	100V-115V~ / 220V-240V~
Operating frequency:	50Hz / 60Hz
Input power:	35VA

  Make sure the mains supply meets the above requirements before power-on, and then press the mains switch. Then the mains supply indicator lamp (~) will be lit.

  If the built-in rechargeable battery is weak when the mains supply is used, it will be recharged automatically at the same time. Then both the mains supply indicator lamp (~) and the battery recharging indicator lamp (→▭) will be lit. The 3-channel electrocardiograph can not be recharged when it is printing reports, and the battery recharging indicator is black; when the 3-channel electrocardiograph is switched off, the battery recharging indicator lamp (→▭) is black if the battery is fully recharged.

♦ **Built-in rechargeable battery**

When the built-in rechargeable lithium battery is used, turn on the unit by pressing the **ON/OFF** key on the control panel directly. Then the battery indicator lamp ( ) will be lit and the battery symbol will be displayed on the LCD screen. Because of the consumption during the storage and transport course, the battery capacity may not be full. If the symbol and the Hint information *BAT WEAK* are displayed, which means the battery capacity is low, please recharge the battery first.

Please refer to the maintenance section for how to recharge the battery. When the battery is being recharged, SE-3 can be powered by the mains supply at the same time.

WARNING

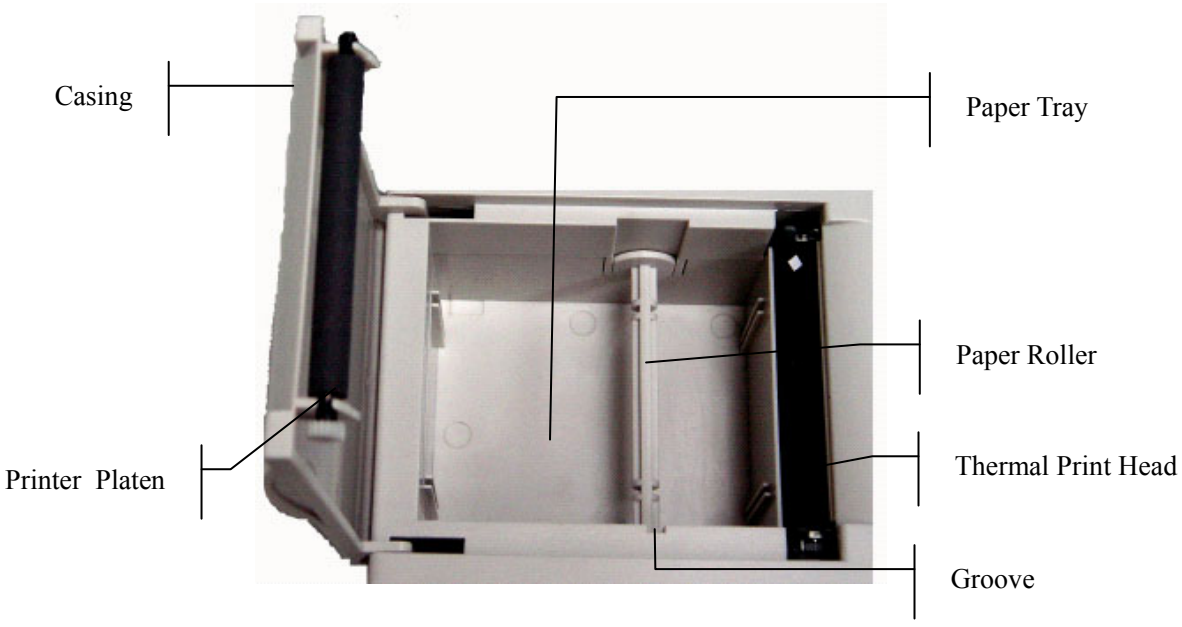
The potential equalization conductor of the unit should be connected to the potential equalization bus bar of the electrical installation when necessary.

4.2 Loading/Replacing Recorder Paper

There are two kinds of recorder paper. One is the rolled thermal paper with the width of 80mm, and the other is the folded thermal paper with the width of 80mm.

Note: When the folded thermal paper is used, the paper roller is unnecessary and must be taken out.

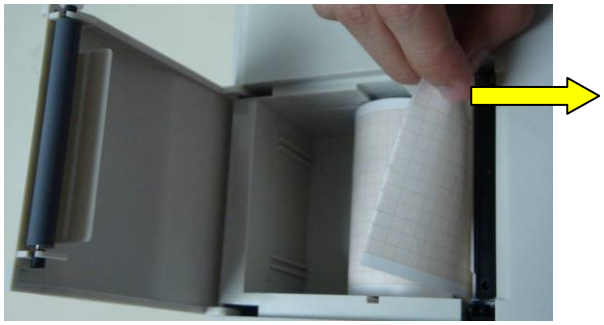
When the recorder paper runs out or is not loaded, warning message *Paper?* will appear on the screen. Then you should load or replace the recorder paper immediately.



Loading/Replacing Process of Rolled Thermal Paper:

1) Place fingers under the two flanges of the recorder casing, pull them upwards directly to release the casing.

2) Take out the paper roller, and remove remainder paper from the roller if necessary.
3) Take off the wrapper of the new thermal paper roll, and then put the paper roll through the roller.
4) Place the paper and the roller gently in the recorder with the roller pin clicking into the groove.
5) Pull about 2 cm of paper out with the grid side of the paper facing the thermal print head, and shut the recorder casing.



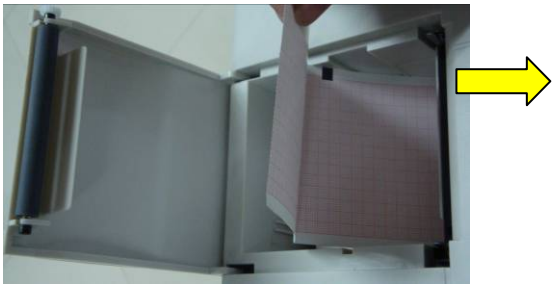
6) Press down the recorder casing firmly.

Loading/Replacing Process of Folded Thermal Paper:

1) Place fingers under the two flanges of the recorder casing, pull them upwards directly to release the casing.

2) Remove remainder paper in the paper tray if necessary.
3) Take off the wrapper of the new folded thermal paper, and then put it in the paper tray.

4) Pull about 2 cm of paper out with the grid side of the paper facing the thermal print head, and shut the recorder casing.



5) Press down the recorder casing firmly.

4.3 Preparing the Patient

4.3.1 Instructing the Patient

Before attaching the electrodes, greet the patient and explain the procedure. Explaining the procedure decreases the patient's anxiety. Reassure the patient that the procedure is painless. Privacy is important for relaxation. When possible, prepare the patient in a quiet room or area where others can't see the patient. Make sure that the patient is comfortable. The more relaxed the patient is, the less the ECG will be affected by noise.

4.3.2 Preparing the Skin

Thorough skin preparation is very important. The skin is a poor conductor of electricity and frequently creates artifact that distorts the ECG signal. By performing methodical skin preparation, you can greatly reduce the possibility of the noise caused by muscle tremor and baseline drift, ensuring high-quality ECG waves. There is natural resistance on the skin surface due to dry, dead epidermal cells, oils and dirt.

To prepare the skin

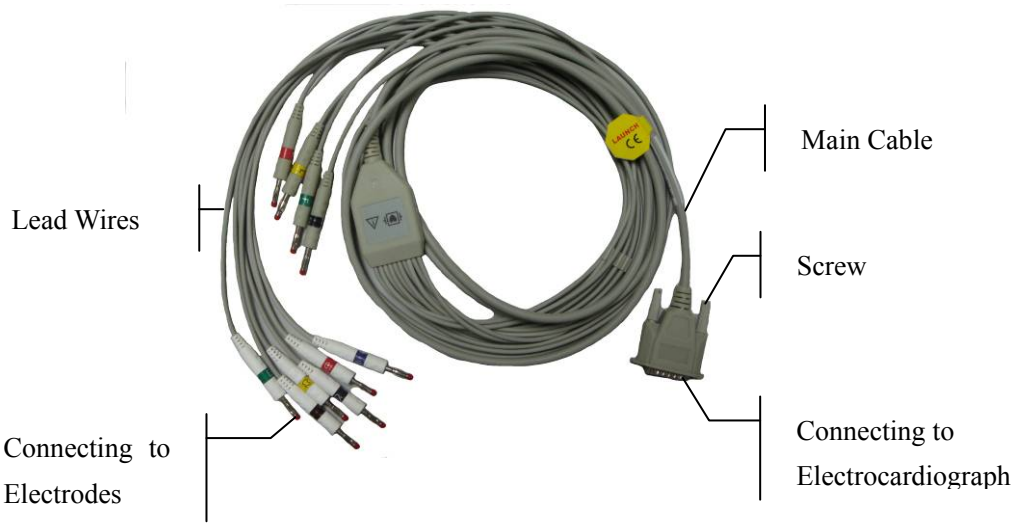
1. Shave hair from electrode sites, if necessary. Excessive hair prevents a good connection.
2. Wash the area thoroughly with soap and water.
3. Dry the skin with a gauze pad to increase capillary blood flow to the tissues and to remove the dead, dry skin cells and oils.

4.4 Connecting the Patient Cable to the Electrocardiograph and Electrodes

WARNING

The performance and electric shock protection can be guaranteed only if original patient cable and electrodes of the manufacturer are used.

The patient cable includes main cable and lead wires which can be connected to electrodes according to the colors and identifiers.



1. Connecting the Patient Cable to the Electrocardiograph

Connect the patient cable to the patient cable socket on the right side of the main unit, and then secure them with two screws.

2. Connecting the Patient Cable to Electrodes

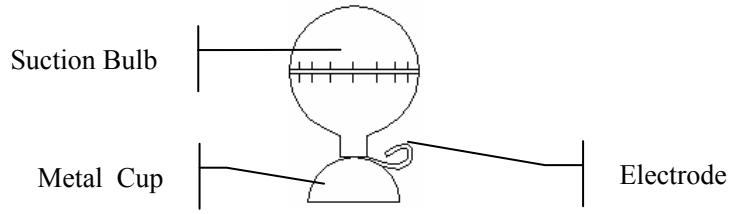
Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers. Firmly attach them.

4.5 Attaching Electrodes to the Patient

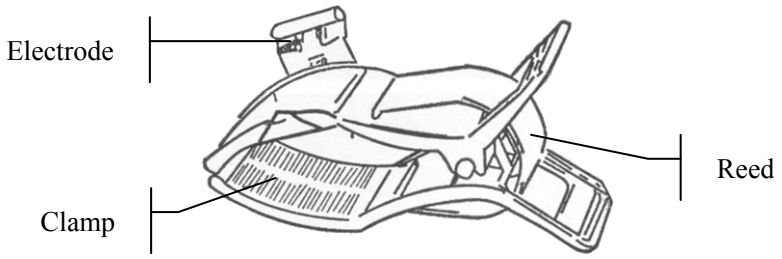
There are two types of electrode for you to choose, one is the reusable electrodes, and the other is the disposable electrodes. The uses of the two types of electrode are as shown below:

4.5.1 Reusable Electrodes

Reusable Electrodes is divided into Limb electrode and Chest Electrode, as the following figure shows:



Chest Electrode



Limb Electrode

The identifiers and color codes of electrodes used comply with IEC/EN requirements. In order to avoid incorrect connections, the electrode identifiers and color codes are specified in Table 4-1. Moreover the equivalent codes according to American requirements are given in Table 4-1 too.

Table 4-1 Electrodes and Their identifiers and color codes

	European		**American**	
Electrodes	**Identifier**	**Color code**	**Identifier**	**Color code**
Right arm	R	Red	RA	White
Left arm	L	Yellow	LA	Black
Right leg	N or RF	Black	RL	Green
Left leg	F	Green	LL	Red
Chest 1	C1	White/red	V1	Brown/red
Chest 2	C2	White/yellow	V2	Brown/yellow
Chest 3	C3	White/green	V3	Brown/green
Chest 4	C4	White/brown	V4	Brown/blue

Chest 5	C5	White/black	V5	Brown/orange
Chest 6	C6	White/violet	V6	Brown/violet

As the following figure shows, the positions of chest electrodes on the body surface are

C1: Fourth intercostal space at the right border of the sternum

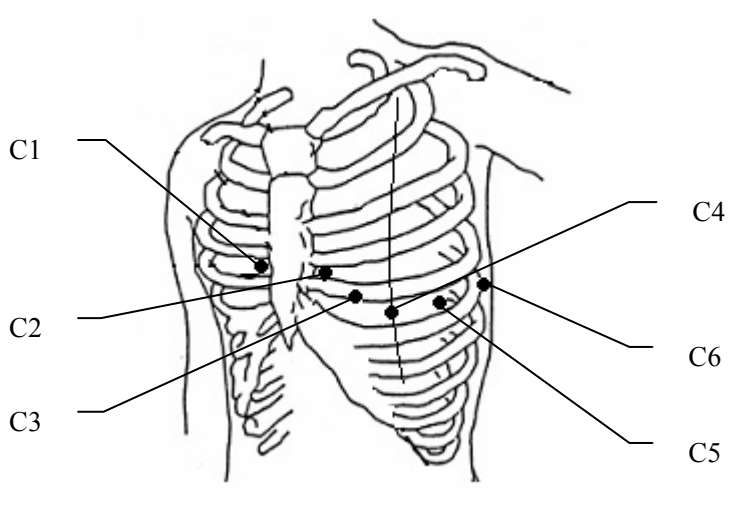
C2: Fourth intercostal space at the left border of the sternum

C3: Fifth rib between C2 and C4

C4: Fifth intercostal space on the left midclavicular line

C5: Left anterior axillary line at the horizontal level of C4

C6: Left midaxillary line at the horizontal level of C4



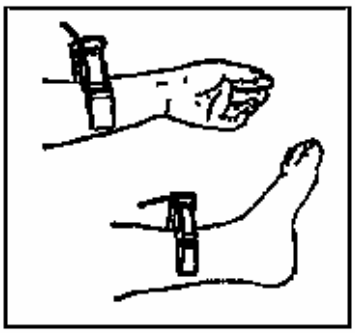
Chest Electrode Connection:

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area on the chest surface with 75% alcohol;
4) Daub the round area of 25mm in diameter on each electrode site with gel evenly;
5) Place a small amount of gel on the brim of chest electrode's metal cup;
6) Place the electrode on the chest electrode site and squeeze the suction bulb. Unclench it and the electrode is adsorbed on the chest;
7) Attach all chest electrodes in the same way.

Note: Long-time measurement with a strong negative pressure on the suction bulb may cause reddening of the skin. When using the electrode on small children or patients with delicate skin, squeeze the suction ball lightly.

Limb Electrode Connection:

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area which is a short distance above the ankle or the wrist with alcohol;
4) Daub the electrode area on the limb with gel evenly;
5) Place a small amount of gel on the metal part of the limb electrode clamp;
6) Connect the electrode to the limb, and make sure that the metal part is placed on the electrode area above the ankle or the wrist;
7) Attach all limb electrodes in the same way.



4.5.2 Disposable Electrodes

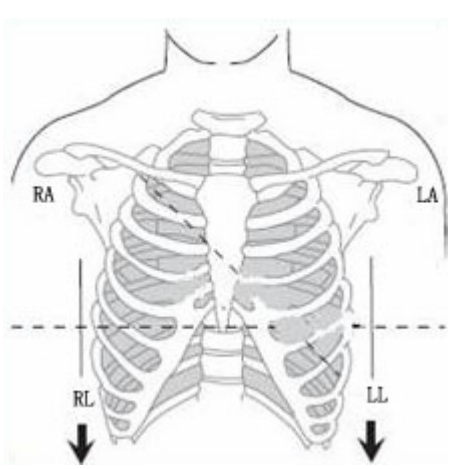
Disposable Electrode

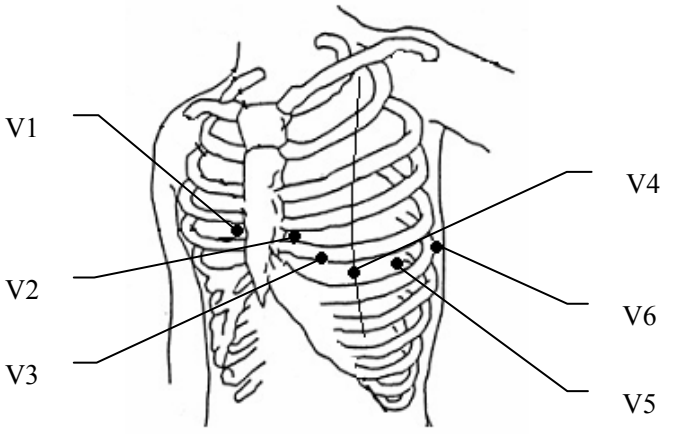
Alligator Clip

Disposable electrode must be used together with the alligator clip.

The electrodes' positions on body surface are as the following table and figures:

American label	European label	Electrode placement
RA	R	Right deltoid
LA	L	Left deltoid
RL	N or RF	Above right ankle (Alternate placement, upper leg as close to torso as possible)
LL	F	Above left ankle (Alternate placement, upper leg as close to torso as possible)
V1	C1	Fourth intercostals space at right border of sternum
V2	C2	Fourth intercostals space at left border of sternum
V3	C3	Fifth rib between V2 and V4
V4	C4	Fifth intercostals space on left midclavicular line
V5	C5	Left anterior axillary line at the horizontal level of V4
V6	C6	Left midaxillary line at the horizontal level of V4





Disposable Electrode connection

1) Align all lead wires of the patient cable to avoid twisting, and connect the alligator clips to the lead wires.
2) Clean the electrode areas on the body surface with 75% alcohol.
3) Attach the disposable electrodes to the electrode positions on body surface.
4) Clip the disposable electrodes with the alligator clips.

The quality of ECG waveform will be affected by the contacting resistance between the patient and the electrode. In order to get a high-quality ECG, the skin-electrode resistance must be minimized when you attach electrodes to patients.

CAUTION

The disposable electrodes can only be used for one time.

WARNING

1. Make sure that all electrodes are connected to the patient correctly before operation.
2. Make sure that the conductive parts of electrodes and associated connectors, including neutral electrode, do not come in contact with earth or any other conducting objects.

4.6 Inspection Before Power On

In order to avoid safety hazards and get good ECG records, the following inspection procedure is recommended before power-on and operation.

1) **Environment**:

- ♦ Make sure that there is no electromagnetic interference source around the equipment, especially large medical electrical equipment such as electrosurgical equipment, radiological equipment, magnetic resonance imaging equipment etc. Switch off these devices when necessary.
- ♦ Keep the examination room warm to avoid muscle action voltages in ECG signals caused by cold.

2) **Power Supply**:

- ♦ If the mains supply is used, please check whether the power cord is connected to the unit well. The grounded three-phase outlet should be used.
- ♦ When the battery capacity is low, recharge the battery before use.

3) **Patient Cable**:

- ♦ Check whether the patient cable is connected to the unit firmly, and keep it far away from the power cord.

4) **Electrodes**:

- ♦ Check whether all electrodes are connected to lead wires of the patient cable correctly.
- ♦ Ensure that the chest electrodes do not contact.

5) **Recorder Paper**:

- ♦ Ensure that there is enough recorder paper loaded correctly.

6) **Patient**:

- ♦ The patient should not come into contact with conducting objects such as earth, metal parts etc.
- ♦ Ensure the patient is warm and relaxed, and breathe calmly.

WARNING

The electrocardiograph is provided for the use of qualified physicians or personnel professionally trained, and they should be familiar with the contents of this user manual before operation.

Chapter 5 Switching on the Electrocardiograph

- When the mains supply is used, connect the power cord, press the mains switch on the left side of the unit, and then the mains supply indicator lamp (∿) is lit. Then press the **ON/OFF** key on the control panel to turn on the unit. The equipment information such as the device name, the version number will be displayed on the LCD screen after self-test. Then SE-3 is ready for use.
- When a built-in rechargeable lithium battery is used, press the **ON/OFF** key on the control panel directly to turn on the unit, and then the battery indicator (▭) is lit. The equipment information such as the device name, the version number will be displayed on the LCD screen after self-test. Then SE-3 is ready for use.

Chapter 6 Sampling and Printing ECG

6.1 Entering Patient Information

After switched on, the electrocardiograph begins sampling ECG.

1. Enter the information of sex and age on the main interface.
   1) Press the Up or Down arrow to select the sex or age item.
   2) Press the Left or Right arrow to enter the information of patient sex or age

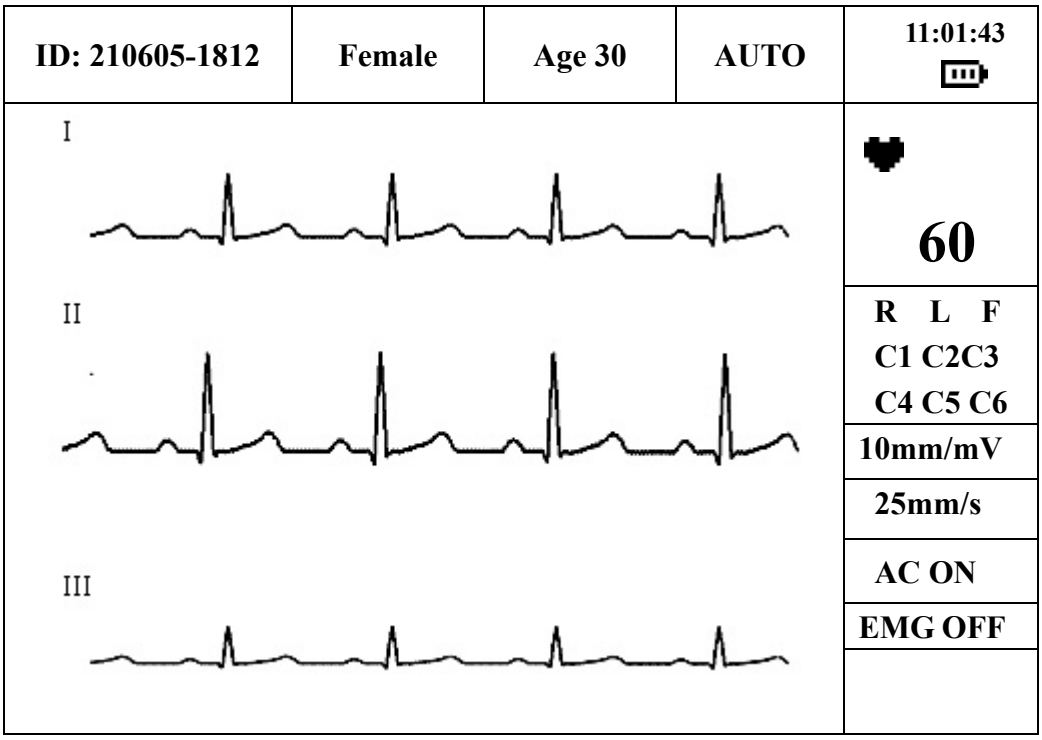


Figure 6-1 Main Interface (SE-3 Wide screen)

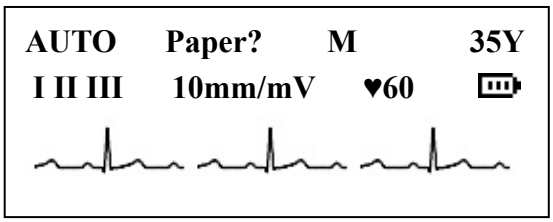


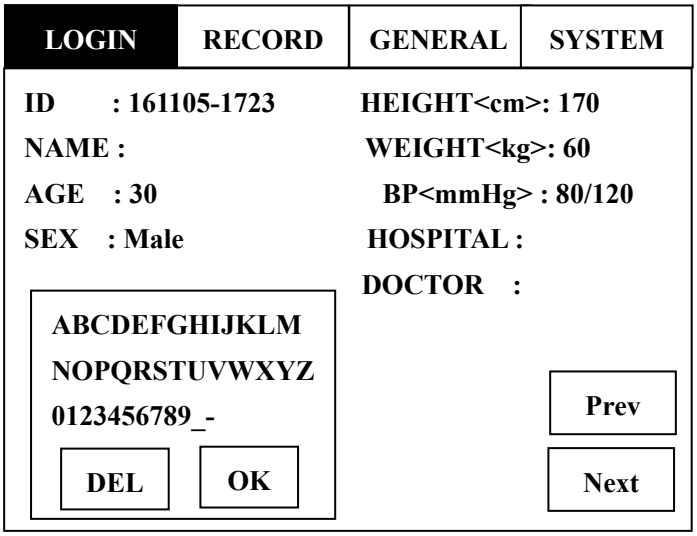
Figure 6-2 Main Interface (SE-3 Narrow screen)

2. The system generates patient ID automatically according to the examination time. You can also enter patient ID manually in the following ways.
   1) Press the Up or Down arrow to select the ID item on the main interface, and then press the Left or Right arrow to set the ID item. (Only for SE-3 Wide screen)

2) Or press the **MENU** key to open the system setup interface. Press the Up or Down arrow to select the ID item. Press the Left or Right arrow to set the ID item. (Only for SE-3 Narrow screen)

3. Or you can enter the detailed information about the patient and the doctor on the system setup interface. (Only for SE-3 Wide screen)

Press the **MENU** key to open the system setup interface. Edit patient information on the login setting interface.



Note: The patient information can not be set or changed during the printing course.

To Enter Name:

1) Press the Up or Down arrow to select the **NAME** item, and a textbox appears after the **NAME** item.

2) Press the Left or Right arrow and the textbox becomes highlighted. Then press the Up, Down, Left or Right arrow to select a letter or a number on the soft keyboard. After that, press the **MENU** key to add the selected letter or number to the textbox.

3) To delete wrong letters, firstly press the Up, Down, Left or Right arrow to select the **DEL** button on the soft keyboard, and then press the **MENU** key to confirm.

4) Press the Up, Down, Left or Right arrow to select the **OK** button on the soft keyboard, and then press the **MENU** key to confirm.

You can enter the hospital name and the doctor name in the same way.

To Enter ID:

1) Press the Up or Down arrow to select the **ID** item.
2) Press the Left or Right arrow to set the **ID** item.
3) Press the **MENU** key to confirm.

You can enter age, BP, sex, height and weight in the same way.

6.2 Printing ECG Reports

There are four modes to print ECG reports.

In the **AUTO** mode, the lead groups are switched in order automatically during the printing course. There is a blank area on the recorder paper before printing the ECG signals of the next lead group. Moreover, a 1mV calibration mark will be printed at the beginning of ECG reports. The switch orders of lead groups are listed in Table 2-1.

In the **MANUAL** mode, you should switch the lead group manually. You can determine the lead group to be printed and set the printing settings or other parameters for different lead groups.

In the **RHYTHM** mode, you can print 60s rhythm-lead ECG waveforms.

In the **USBPRT** mode, ECG reports can be printed out through a USB printer.

Note: The printing mode can not be changed during the printing course. Stop printing reports before changing the printing mode.

6.2.1 AUTO Mode

1) Press the **MODE/RST** key to select the **AUTO** mode, which will be displayed in the top right corner of the LCD screen.
2) Press the **SENS** key to set the sensitivity.
3) Set the gain, AC filter and EMG filter to get good ECG traces. Press the Up or Down arrow to select the gain, AC filter and EMG filter item. Then press the Left or Right arrow to set them. (Only for SE-3 Wide screen)
4) Or press the **MENU** key to open the system setup interface to set the detailed settings. Press the **MENU** key again to return to the main interface. For details about settings, please refer to chapter 8 “Settings (SE-3 Wide screen)” and chapter 9 “Settings (SE-3 Narrow screen)”.
5) Press the Up or Down arrow to select the speed item. Then press the Left or Right arrow to set the speed.

6) Press the **PRINT/STOP** key to begin printing ECG reports. It will stop automatically after printing a complete ECG report of 12 leads. Or press the **PRINT/STOP** key again to stop printing reports.

Press **PRINT/STOP** during the printing course to stop printing ECG reports. Then when you begin printing ECG reports again, the system will print ECG reports from the first lead group, and the ID number will change automatically according to the current examination time. You can adjust the ID number manually. For details on setting the ID number, see section 6.1, "Entering Patient Information".

6.2.2 MANUAL Mode

1) Press the **MODE/RST** key to select the **MANUAL** mode, which will be displayed in the top right corner of the LCD screen.
2) Press the **SENS** key to set the sensitivity.
3) Set the gain, AC filter and EMG filter to get good ECG traces. Press the Up or Down arrow to select the gain, AC filter and EMG filter item. Then press the Left or Right arrow to set them. (Only for SE-3 Wide screen)
4) Or press the **MENU** key to open the system setup interface to set the detailed settings. Press the **MENU** key again to return to the main interface. For details about settings, please refer to chapter 8 "Settings (SE-3 Wide screen)" and chapter 9 "Settings (SE-3 Narrow screen)".
5) Press the Lead switch key to select the lead group to be printed.
6) Press the Up or Down arrow to select the speed item. Then press the Left or Right arrow to set the speed.
7) Press the **PRINT/STOP** key to begin printing reports.
8) Press the **1mV/COPY** key to print out 1mV mark in the ECG report. Press the Lead switch key to switch the lead group while printing ECG reports.
9) Press the **PRINT/STOP** key to stop printing ECG reports.

Press **PRINT/STOP** during the printing course to stop printing ECG reports. Then when you begin printing ECG reports again, the ID number will change automatically according to the current examination time. You can adjust the ID number manually. For details on setting the ID number, see section 6.1, "Entering Patient Information".

6.2.3 RHYTHM mode

1) Press the **MODE/RST** key to select the **RHYTHM** mode; which will be displayed in the top right corner of the LCD screen.
2) Press the **SENS** key to set the sensitivity.
3) Set the gain, AC filter and EMG filter to get good ECG traces. Press the Up or Down arrow to select the gain, AC filter and EMG filter item. Then press the Left or Right arrow to set them. (Only for SE-3 Wide screen)
4) Or press the **MENU** key to open the system setup interface to set the **RHYTHM LEAD** item or other settings. Press the **MENU** key again to return to the main interface. For details about settings, please refer to chapter 8 "Settings (SE-3 Wide screen)" and chapter 9 "Settings (SE-3 Narrow screen)".
5) Press the Up or Down arrow to select the speed item. Then press the Left or Right arrow to set the speed.
6) Press the **PRINT/STOP** key, the hint information *Sampling* will be displayed on the main interface, and the sampling time will be counted. When the sampling time reaches 60s, it begins to print ECG reports.
7) It will stop automatically after printing a complete report of rhythm-lead ECG waveforms. Or press the **PRINT/STOP** key again to stop printing ECG reports.

Press **PRINT/STOP** during the printing course to stop printing ECG reports. Then when you begin printing ECG reports again, the ID number will change automatically according to the current examination time. You can adjust the ID number manually. For details on setting the ID number, see section 6.1, "Entering Patient Information".

6.2.4 USBPRT mode

1) Connect SE-3 to the USB printer recommended by the manufacturer. Please refer to section 8.2.4 "USB Printer Settings" for details.
2) Press the **MODE/RST** key to select the **USBPRT** mode, which will be displayed in the top right corner of the LCD screen.
3) Press the **SENS** key to set the sensitivity.
4) Set the gain, AC filter and EMG filter to get good ECG traces. Press the Up or Down arrow to select the gain, AC filter and EMG filter item. Then press the Left or Right arrow to set them. (Only for SE-3 Wide screen).

5) Or press the **MENU** key to open the system setup interface to set the detailed settings. Press the **MENU** key again to return to the main interface. For details about settings, please refer to chapter 8 “Settings (SE-3 Wide screen)” and chapter 9 “Settings (SE-3 Narrow screen)”.
6) Press the Up or Down arrow to select the speed item. Then press the Left or Right arrow to set the speed.
7) Press the **PRINT/STOP** key to begin printing reports. During the printing course，pressing the **PRINT/STOP** key again can not stop printing ECG reports. It will stop automatically after printing a complete ECG report.

6.3 Transmitting ECG Data to the PC

Note: To transmit ECG data to the PC, Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before the transmission.

6.3.1 Transmitting ECG Data Through the Serial Port

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with a RS232 cable.
2. Or if the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly.

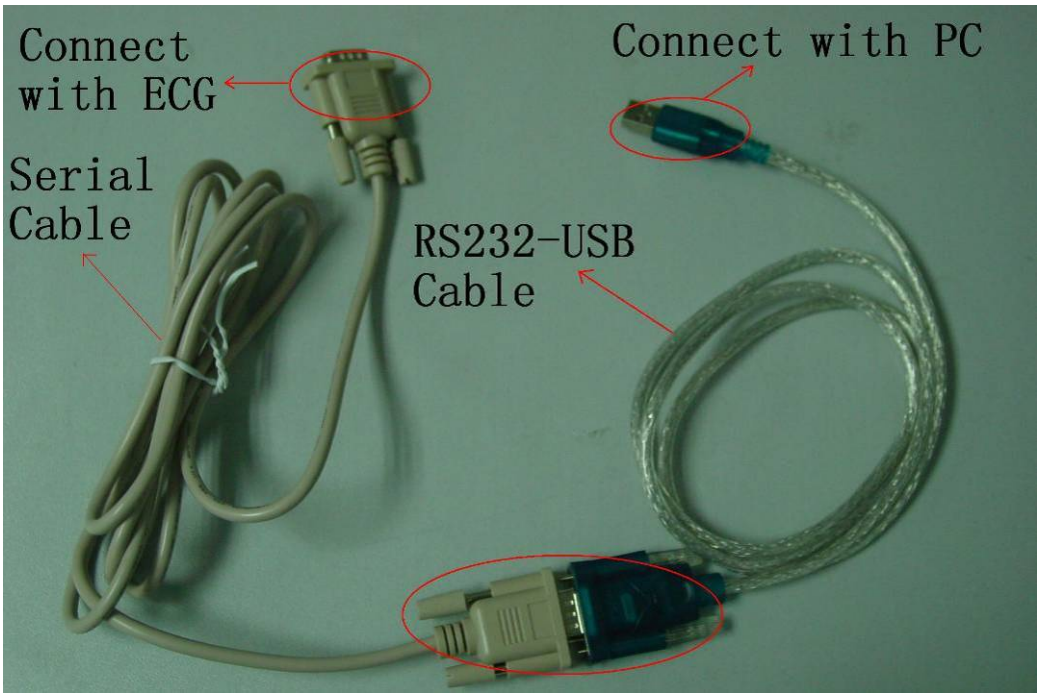


Figure 6-3 RS232-USB Assembly

3. Press the **MENU** key to open the system setup interface.

   For SE-3 Wide screen,

   1) Press the Up or Down arrow to select the **Next** or **Prev** button, and then press the Left or Right arrow to select **GENERAL** tab to open the general setting interface.

   2) Press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **UART AUTO**.

   For SE-3 Narrow screen, press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **UART AUTO**.

   Press the **MENU** key again to return to the main interface.

4. In the **AUTO, OFF** or **USBPRT** mode, ECG data can be transmitted through the UART port automatically after an ECG report is printed out.

6.3.2 Transmitting ECG Data Through the Net Port (Optional, Only for Net Type)

1. Connect the PC to the electrocardiograph with an Ethernet cable recommended by the manufacturer. If the wireless AP transmission is used, connect the PC to one wireless AP, and connect the electrocardiograph to the other wireless AP. Only the wireless AP recommended by the manufacturer can be used.

Note:

1) For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.

2) There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

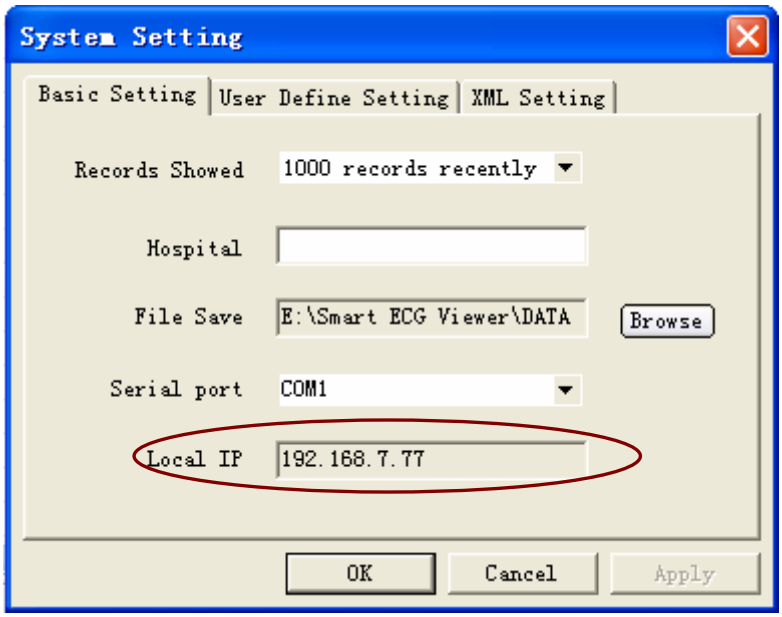
2. Press the **MENU** key to open the system setup interface.

For SE-3 Wide screen,

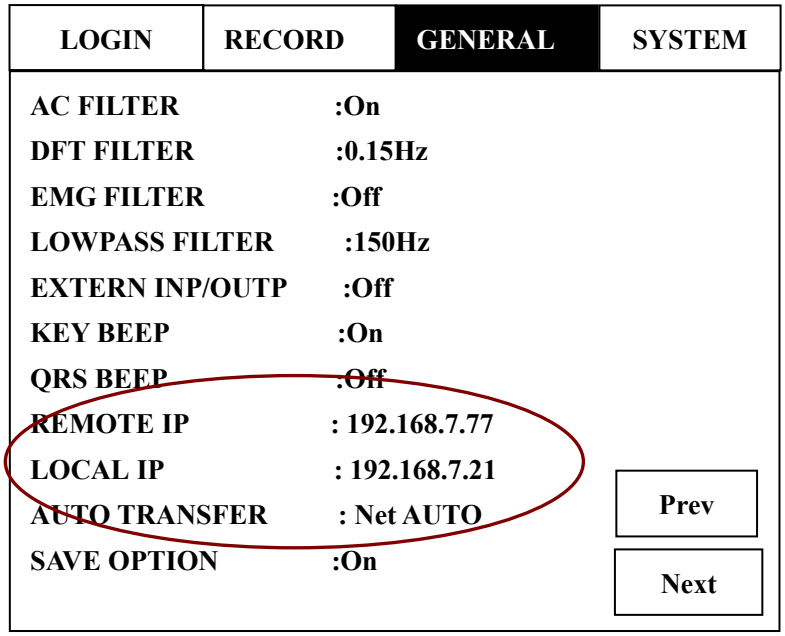
1) Press the Up or Down arrow to select the **Next** or **Prev** button, and then press the Left or Right arrow to select **GENERAL** tab to open the general setting interface.

2) Press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **Net AUTO**. Press the Up or Down arrow to select the **REMOTE IP** item, and then press the Left or Right arrow to set the **REMOTE IP** item to the local IP of Smart ECG Viewer. Press the Up or Down arrow to select the **LOCAL IP** item, and then set the first three numbers of the **LOCAL IP** item to the first three numbers of the local IP of Smart ECG Viewer. The last number of the **LOCAL IP** item can be set at random, but it can't be the same as the last number of the local IP of Smart ECG Viewer.

For example, view the local IP on the **System Setting** interface of the Smart ECG Viewer software.

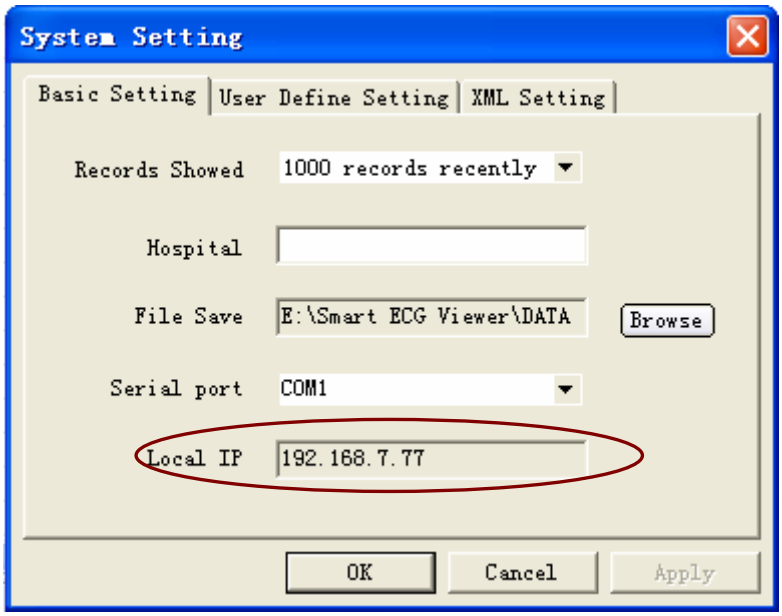


Set the **REMOTE IP** item to the local IP of Smart ECG Viewer. Set the first three numbers of the **LOCAL IP** item to the first three numbers of the local IP of Smart ECG Viewer. The last number of the **LOCAL IP** item can be set at random, but it can't be the same as the last number of the local IP of Smart ECG Viewer.



For SE-3 Narrow screen, press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **Net AUTO**. Press the Up or Down arrow to select the **REMOTE IP** item, and then press the Left or Right arrow to set the **REMOTE IP** item to the local IP of Smart ECG Viewer. Press the Up or Down arrow to select the **LOCAL IP** item, and then set the first three numbers of the **LOCAL IP** item to the first three numbers of the local IP of Smart ECG Viewer. The last number of the **LOCAL IP** item can be set at random, but it can't be the same as the last number of the local IP of Smart ECG Viewer.

For example, view the local IP on the **System Setting** interface of the Smart ECG Viewer software.



Set the **REMOTE IP** item to the local IP of Smart ECG Viewer. Set the first three numbers of the **LOCAL IP** item to the first three numbers of the local IP of Smart ECG Viewer. The last number of the **LOCAL IP** item can be set at random, but it can't be the same as the last number of the local IP of Smart ECG Viewer.

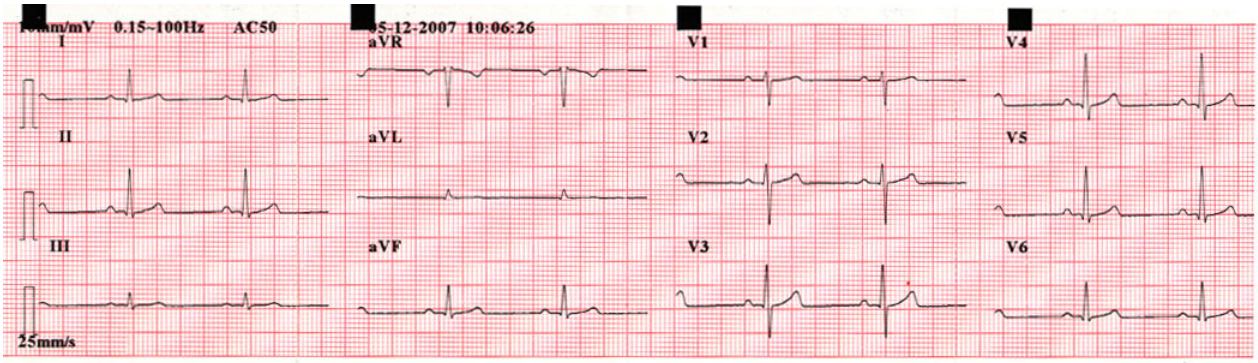
SAVE OPTION	**:On**
AUTO TRANSFER	**: Net AUTO**
LOCAL IP	**: 192.168.7.21**
REMOTE IP	**: 192.168.7.77**

Press the **MENU** key again to return to the main interface.

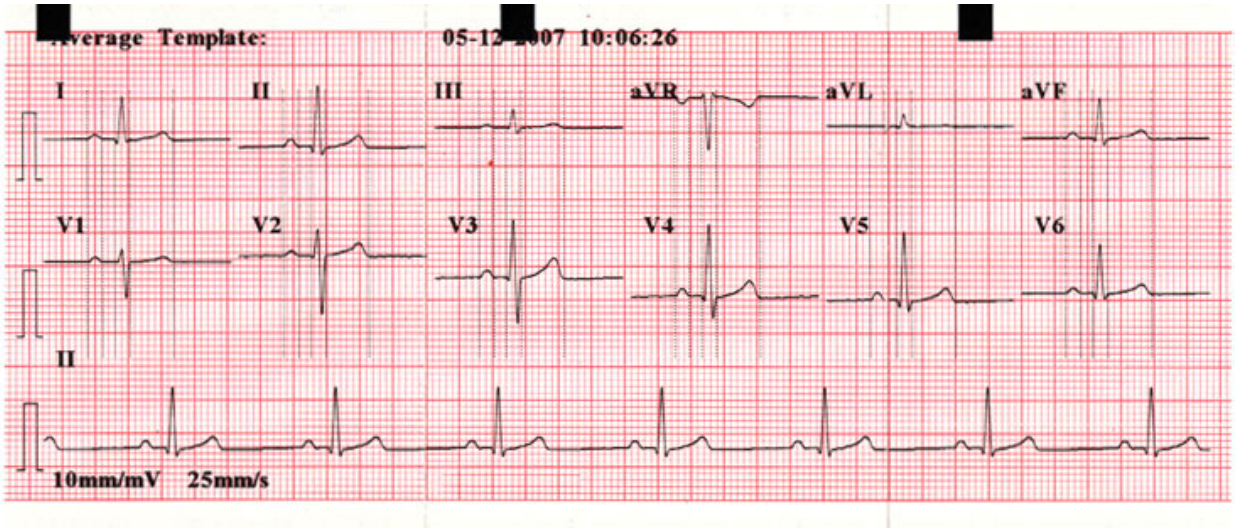
3. In the **AUTO, OFF** or **USBPRT** mode, ECG data can be transmitted through the net automatically after an ECG report is printed out.

6.4 ECG Reports

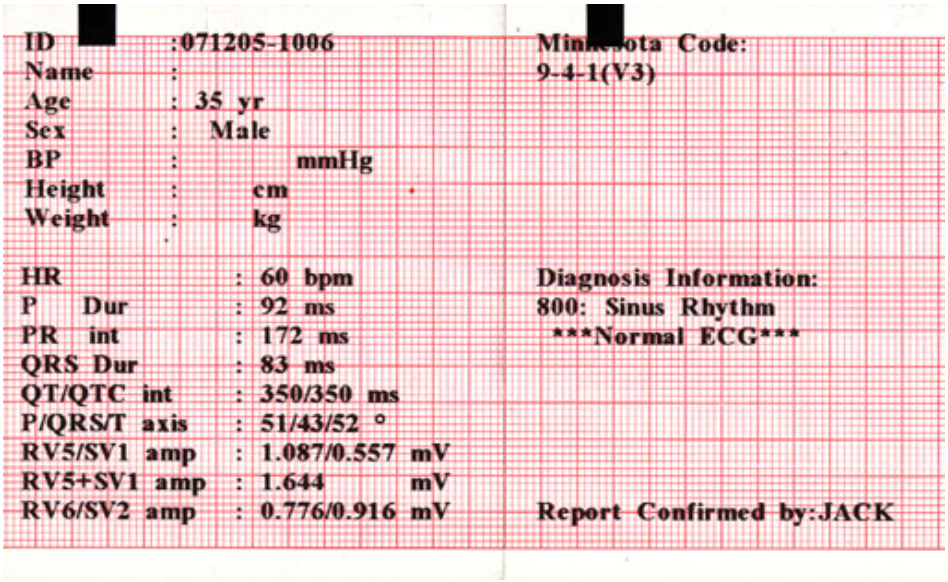
6.4.1 ECG Reports in the AUTO Mode



(a)



(b)



(c)

Figure (a) shows the following contents:

10mm/mV----Sensitivity 0.15~100Hz----Filter Information

AC50----50Hz AC Filter 05-12-2007 10:06:26----Date and Time

⎍----1mV Calibration Mark

I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6----Lead Name

ECG waves of 12 leads in the format of 3Ch/3Ch

25mm/s----Paper speed

Figure (b) shows the average template when the **AVERAGE TEMPLET** item is set to **2×6+1R** on the system setup interface.

Figure (c) shows the measurement and interpretation information when the **MEASUREMENT** and **INTERPRETATION** items are set to **ON** on the system setup interface. The measurement information includes:

ID, Name, Age, Sex, BP, Height, Weight, HR (Heart Rate)

P Dur----P wave duration: the average P-wave duration from several selected dominant beats

PR int----P-R interval: the average P-R interval from several selected dominant beats;

QRS Dur----QRS complex duration: the average QRS complex duration from several selected dominant beats;

QT/QTC int----Q-T interval / Normalized QT interval;

P/QRS/T axis----dominant direction of the average integrated ECG vectors;

RV5/SV1 amp----The maximum amplitude of R or R' wave of one selected dominant beat from lead V5 / The maximum amplitude of S or S' wave of one selected dominant beat from lead V1;

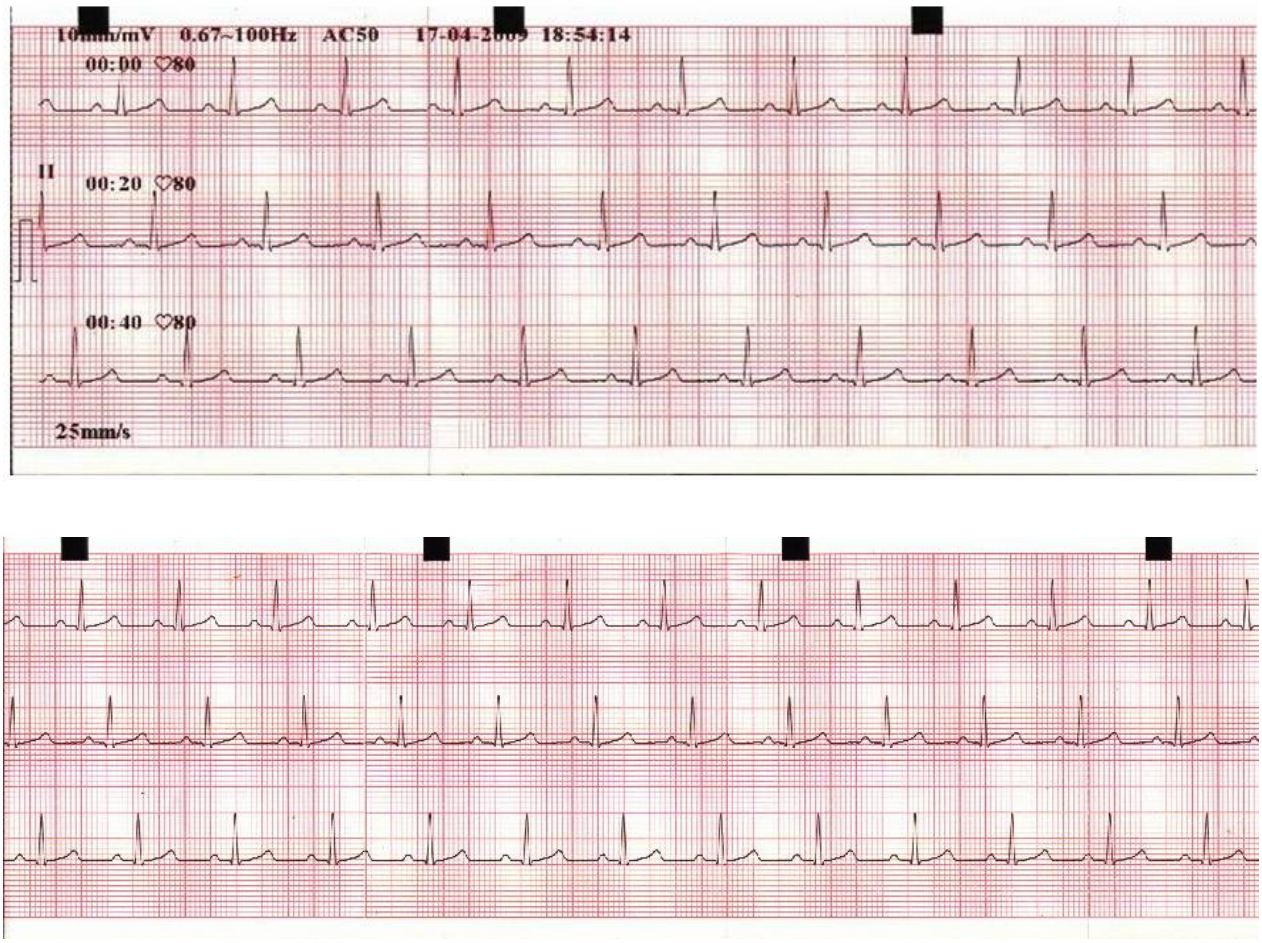
RV5+SV1 amp---- Sum of RV5 and SV1;

RV6/SV2 amp---- The maximum amplitude of R or R' wave of one selected dominant beat from lead V6 / The maximum amplitude of S or S' wave of one selected dominant beat from lead V2;

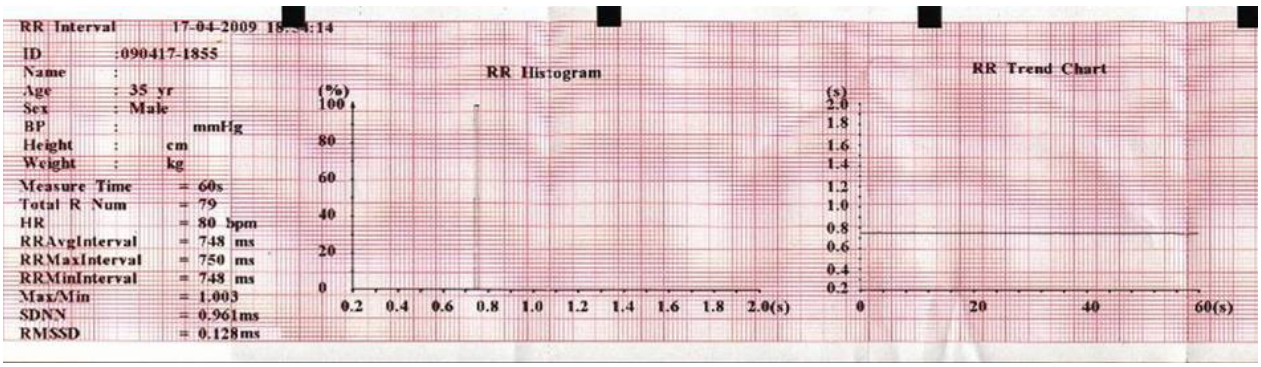
The interpretation information includes: **Minnesota Code**, **Diagnosis Information** and **Report Confirmed by**.

Note: In the **AUTO** or **MANUAL** mode, if the sensitivity is set to **20mm/mV**, only one calibration mark will be printed in the ECG report.

6.4.2 ECG Reports in the RHYTHM Mode



(a)



(b)

Figure (a) shows the following contents:

10mm/mV (Sensitivity)

0.67~100Hz (Filter Information)

AC50 (50Hz AC Filter)

⎍ (1mV Calibration Mark)

II (Lead Name)

60s rhythm waveform of lead II

00:00, 00:20, 00:40 (Timer）

25mm/s (Paper Speed）

♡80 (Heart Rate）

Figure (b) shows RR analysis results, including RR interval measurement information, RR histogram and RR trend chart.

RR Interval measurement information includes the following contents:

Current Date & Current Time

Patient Information (ID, Name, Age, Sex, BP, Height, Weight)

Measure Time

Total R Num (Total R-wave number)

HR (Heart Rate)

RR Avg Interval (Average RR Interval)

RR Max Interval (Maximum RR Interval)

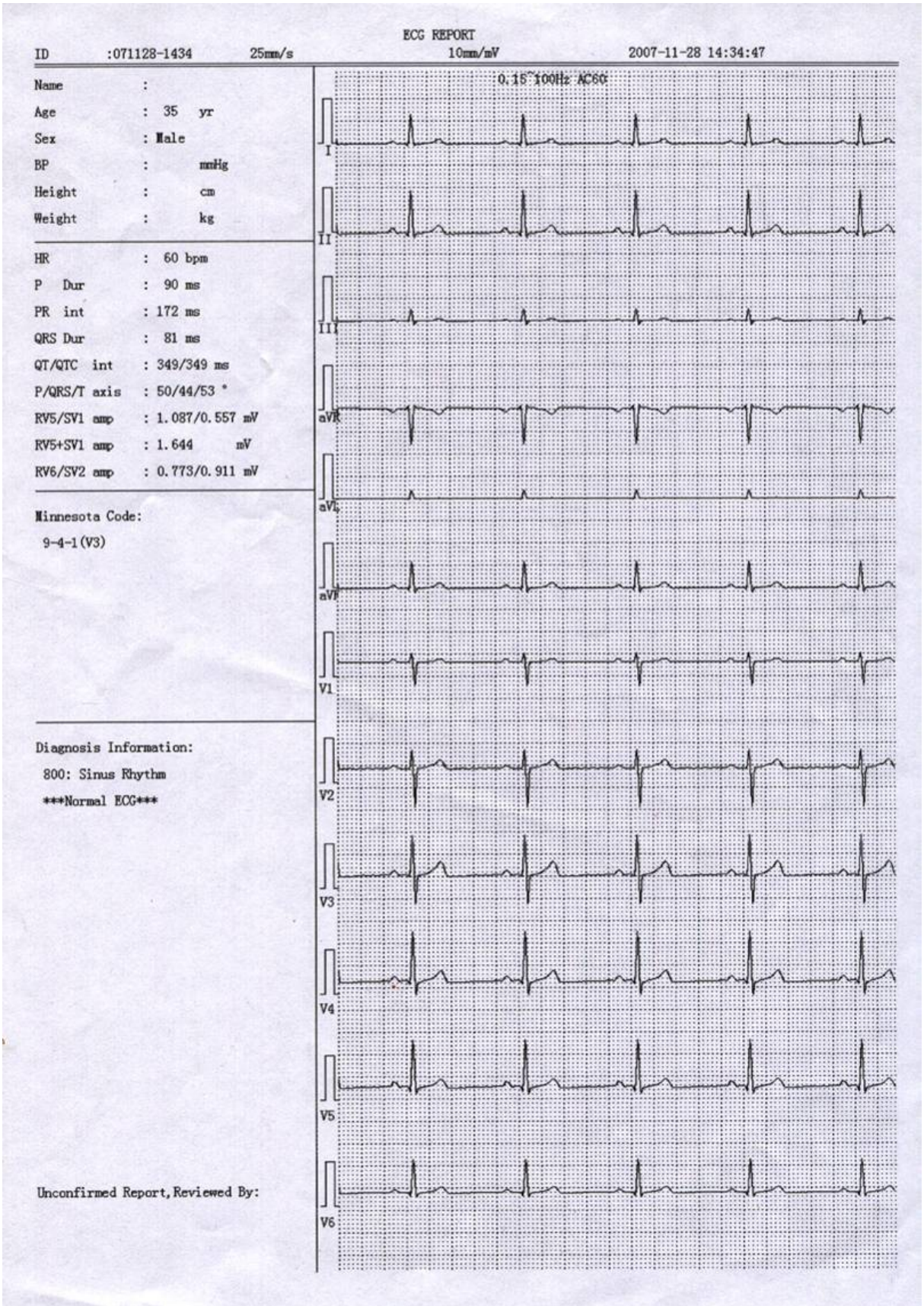
RR Min Interval (Minimum RR Interval)

Max/Min (Ratio of Maximum RR Interval to Minimum RR Interval)

SDNN (Standard Deviation of Normal to Normal Intervals)

RMSSD (The Root Mean Square of Successive Difference)

6.4.3 ECG Reports in the USBPRT Mode



As the above figure shows, the USBPRT mode report includes:

ID, Paper Speed, Sensitivity, Date and Time;

Name, Age, Sex, BP, Height, Weight;

Heart Rate, P Duration, PR Interval, QRS Duration, QT/QTC Interval, P/QRS/T Axis, RV5/SV1 Amplitude, RV5+SV1 Amplitude, RV6/SV2 Amplitude;

Minnesota Code;

Diagnosis Information;

Unconfirmed Report, Reviewed By;

ECG waveforms of 12 leads.

Chapter 7 Managing ECG Records

If you want to save the ECG records in the electrocardiograph, you should set the **SAVE OPTION** item to **On**. The default value is **On**. Then the ECG records will be saved in the recall window automatically.

1. Press the **MENU** key to open the system setup interface.
2. For SE-3 Wide screen
   1) Press the Up or Down arrow to select the **Prev** or **Next** button. Then press the Left or Right arrow to select the **GENERAL** tab.
   2) Press the Up or Down arrow to select the **SAVE OPTION** item. Then press the Left or Right arrow to set the **SAVE OPTION** item to **On.**
   3) Press the **MENU** key again to return to the main interface.
3. For SE-3 Narrow screen
   1) Press the Up or Down arrow to select the **SAVE OPTION** item.
   2) Press the Left or Right arrow to set the **SAVE OPTION** item to **On.**
   3) Press the **MENU** key again to return to the main interface.

Press the **RECALL** key to open the recall window where patient records are saved. The recall window allows records to be stored, deleted, printed and transmitted. When there is no space for more records to be stored in the recall window, the message *MemFull* will be displayed.

7.1 Transmitting ECG Records to the PC

Note: To transmit ECG records to the PC, Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before the transmission.

7.1.1 Transmitting ECG Records Through the Serial Port

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with a RS232 cable.
2. If the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly. For details about the RS232-USB assembly, please refer to section 6.3.1, “Transmitting ECG Data Through the Serial Port”.

3. Press the **MENU** key to open the system setup interface.

   For SE-3 Wide screen,

   1) Press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to select the **GENERAL** tab to open the general setting interface.
   2) Press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **UART AUTO**.

   For SE-3 Narrow screen, press the Up or Down arrow to select the **AUTO TRANSFER** item, and then press the Left or Right arrow to set the **AUTO TRANSFER** item to **UART AUTO**.

   Press the **MENU** key again to return to the main interface.

4. Press the **RECALL** key to open the recall window (a).

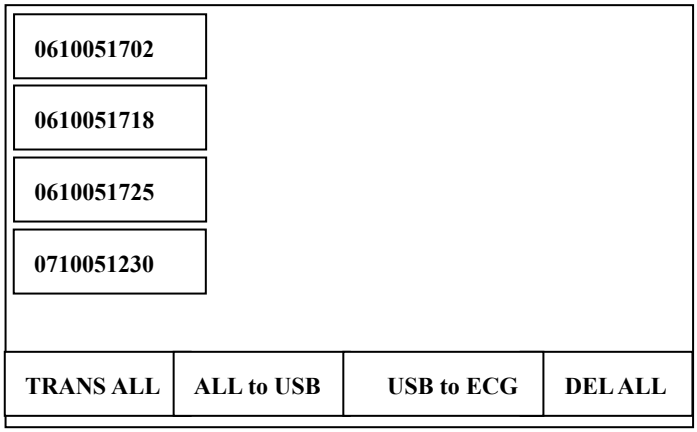
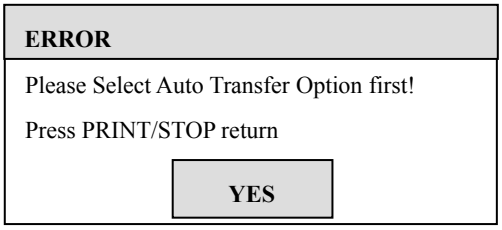


Figure 7-1 Recall Window (a)

5. Press the Up and Down arrow (for SE-3 Wide screen) or Left and Right arrow (for SE-3 Narrow screen) to select the **TRANS ALL** button, and then press the **PRINT/STOP** or **MENU** key to transmit all the records to the PC.

   If the **AUTO TRANSFER** item is set to **OFF** before the transmission, WARNING (a) will pop up.

   WARNING (a)



6. For SE-3 Wide screen, if you want to transmit a record, press the Up, Down, Left or Right arrow to select the record in the recall window. Then press the **PRINT/STOP** or **MENU** key, and the recall window (b) appears. Press the Up or Down arrow to select the **TRANSMIT**

button, and then press the **PRINT/STOP** or **MENU** key to transmit the record to the PC. After the transmission, press the Up or Down arrow to select the **BACK** button, and then press the **PRINT/STOP** or **MENU** key to return to the recall window (a).

For SE-3 Narrow screen, if you want to transmit a record, press the Up or Down arrow to select the record, and then press the Left or Right arrow to select the **TRANSMIT** button, and then press the **PRINT/STOP** or **MENU** key to transmit the record to the PC.

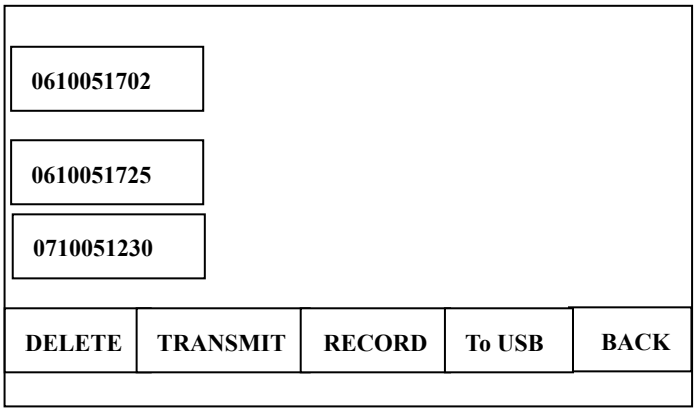


Figure 7-2 Recall Window (b)

Note: The transmission process is long, and you should be patient to wait.

7. Press the **RECALL** key to return to the main interface.

7.1.2 Transmitting ECG Records Through the Net Port (Optional, Only for Net Type)

1. Connect the PC to the electrocardiograph with an Ethernet cable recommended by the manufacturer. If the wireless AP transmission is used, connect the PC to one wireless AP, and connect the electrocardiograph to the other wireless AP. Only the wireless AP recommended by the manufacturer can be used.

   Note:

   1) For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.
   2) There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

2. Press the **MENU** key to open the system setup interface, and set the **AUTO TRANSFER**, **REMOTE IP** and **LOCAL IP** items. Then press the **MENU** key again to return to the main interface. For details on setting the **AUTO TRANSFER**, **REMOTE IP** and **LOCAL IP** items, please refer to section 6.3.2, "Transmitting ECG Data Through the Net Port (Optional, only for Net type)".
3. Press the **RECALL** key to open the recall window (a) (Figure 7-1).
4. Press the Up and Down arrow (for SE-3 Wide screen) or Left and Right arrow (for SE-3 Narrow screen) to select the **TRANS ALL** button, and then press the **PRINT/STOP** or **MENU** key to transmit all the records to the PC.
5. For SE-3 Wide screen, if you want to transmit a record, press the Up, Down, Left or Right arrow to select the record in the recall window. Then press the **PRINT/STOP** or **MENU** key, and the recall window (b) (Figure 7-2) appears. Press the Up or Down arrow to select the **TRANSMIT** button, and then press the **PRINT/STOP** or **MENU** key to transmit the record to the PC. After the transmission, press the Up or Down arrow to select the **BACK** button, and then press the **PRINT/STOP** or **MENU** key to return to the recall window (a) (Figure 7-2).

   For SE-3 Narrow screen, if you want to transmit a record, press the Up or Down arrow to select the record, and then press the Left or Right arrow to select the **TRANSMIT** button, and then press the **PRINT/STOP** or **MENU** key to transmit the record to the PC.

Note: The transmission process is long, and you should be patient to wait.

6. Press the **RECALL** key to return to the main interface.

7.2 Copying ECG Records Between SE-3 and the U Disk

1. Connect the U disk to SE-3.
2. Press the **RECALL** key to open the recall window (a) (Figure 7-1).
3. Press the Up or Down arrow to select the **ALL to USB** button, and then press the **PRINT/STOP** or **MENU** key, and then the **ECGDATA** folder of all the records will be transmitted to the U disk automatically.

   During the transmission, if something wrong happens, SE-3 will give the error information. Then you should check whether the U disk is connected to the electrocardiograph well.

4. If you want to import records from the **ECGDATA** folder of the U disk to the electrocardiograph, press the Up or Down arrow to select the **USB to ECG** button, and then press the **PRINT/STOP** or **MENU** key. The extended-name of imported records should be ".dat".

Note: To import records from the U disk to the electrocardiograph, there should be some records in the folder named ECGDATA in the U disk. The folder name ECGDATA must be capital letters. You should not change the name of records in the **ECGDATA** folder.

During the transmission from the U disk to the electrocardiograph, if something wrong happens, the electrocardiograph will give the error information. Then you should do the following operations:

1) Firstly, check whether the U disk is connected well.
2) If the error information is still displayed, you should check whether there is the **ECGDATA** folder including some records with the extended-name of ".dat" in the U disk.
3) If the error information is still displayed, you should check whether the total number of records in the **ECGDATA** folder of the U disk and the recall window of the electrocardiograph exceeds the limit. The limit of SE-3 Narrow screen is 120, and the limit of SE-3 Wide screen is 144. If the total number exceeds the limit, you should remove some records from the **ECGDATA** folder of the U disk, and then continue to import the remainder records to the electrocardiograph.
4) If the error information *The same record found! Press PRINT/STOP return* is displayed, you should check whether there are cognominal records in the U disk and the electrocardiograph. If it is true, you should remove these records from the U disk, or delete these records in the electrocardiograph, and then continue to import records to the electrocardiograph.

After records are imported, the electrocardiograph will give a hint.

5. For SE-3 Wide screen, if you want to transmit a record, press the Up, Down, Left or Right arrow to select the record in the recall window. Then press the **PRINT/STOP** or **MENU** key, and the recall window (b) (Figure 7-2) appears. Press the Up or Down arrow to select the **TO USB** button. Then press the **PRINT/STOP** or **MENU** key. After the transmission, press the Up or Down arrow to select the **BACK** button, and then press the **PRINT/STOP** or **MENU** key to return to the recall window (a) (Figure 7-2).

For SE-3 Narrow screen, if you want to transmit a record, press the Up or Down arrow to select the record, and then press the Left or Right arrow to select the **TO USB** button, and then press the **PRINT/STOP** or **MENU** key.

6. Press the **RECALL** key to return to the main interface.

Note:

1. The transmission process is long, and you should be patient to wait. During the transmission, the U disk should not be pulled out.
2. Only the U disk with FAT format can be used.

7.3 Deleting Patient Records

1. Press the **RECALL** key to open the recall window (a) (Figure 7-1).
2. If you want to delete all the records, press the Up and Down arrow (for SE-3 Wide screen) or Left and Right arrow (for SE-3 Narrow screen) to select the **DEL ALL** button, and then press the **PRINT/STOP** or **MENU** key to display the WARNING (b). Then press **RECALL** to delete all the records or press **PRINT/STOP** to cancel the operation.

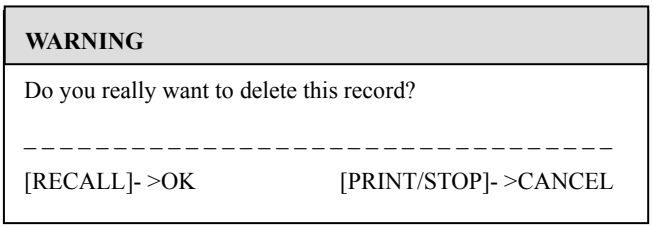
WARNING (b)

WARNING
Do you really want to delete all the records?
[RECALL]- >OK [PRINT/STOP]- >CANCEL

3. For SE-3 Wide screen, if you want to delete a record, press the Up, Down, Left or Right arrow to select the record in the recall window. Then press the **PRINT/STOP** or **MENU** key, and the recall window (b) (Figure 7-2) appears. Press the Up or Down arrow to select the **DELETE** button, and then press the **PRINT/STOP** or **MENU** key to display the WARNING(c). Then press **RECALL** to delete this record or press **PRINT/STOP** to cancel the operation. After deleting the record, press the Up or Down arrow to select the **BACK** button, and then press the **PRINT/STOP** or **MENU** key to return to the recall window (a) (Figure 7-2).

   For SE-3 Narrow screen, if you want to delete a record, press the Up or Down arrow to select the record, and then press the Left or Right arrow to select the **DELETE** button, and then press the **PRINT/STOP** or **MENU** key to display the WARNING(c). Then press **RECALL** to delete this record or press **PRINT/STOP** to cancel the operation.

WARNING (c)



4. Press the **RECALL** key to return to the main interface.

7.4 Printing a Patient Record in the Recall Window

1. Press the **MENU** key to open the system setup interface.

   For SE-3 Wide screen, press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to open the record setting interface. Then set the detailed settings on the record setting interface.

   For SE-3 Narrow screen, set the detailed settings on the system setup interface.

   Press the **MENU** key again to return to the main interface.

Note: Before printing, please set the detailed printing settings. For details, see section 8.2, “Record Settings”.

2. Press the **MODE/RST** key to select the printing mode. Only the **AUTO** mode and the **USBPRT** mode can support printing ECG records in the recall window.

3. Press the **RECALL** key to open the recall window (a) (Figure 7-1).

4. For SE-3 Wide screen, press the Up, Down, Left or Right arrow to select a record in the recall window. Then press the **PRINT/STOP** or **MENU** key, and the recall window (b) (Figure 7-2) appears

   Press the Up or Down arrow to select the **RECORD** button, and then press the **PRINT/STOP** or **MENU** key to print the record. Pressing **PRINT/STOP** again can stop printing the record in the **AUTO** mode.

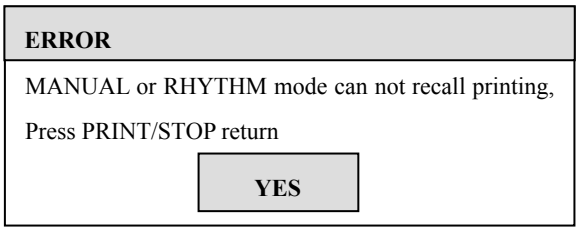
   For SE-3 Narrow screen, press the Up or Down arrow to select the record, and then press the Left or Right arrow to select the **RECORD** button, and then press the **PRINT/STOP** or **MENU** key to print the record. Pressing **PRINT/STOP** again can stop printing the record in the **AUTO** mode.

Note:

1. If you select the **USBPRT** mode, when the **PRINT/STOP** or **MENU** key is pressed, the electrocardiograph begins to analyze data. Then the USB printer begins to print the ECG record after 8 seconds.
2. The **MANUAL** or **RHYTHM** mode can not support printing ECG records in the recall window.

If you select the **MANUAL** or **RHYTHM** mode, WARNING (d) will pop up.

WARNING (d)



5. For SE-3 Wide screen, after printing the ECG record, press the Up or Down arrow to select the **BACK** button, and then press the **PRINT/STOP** or **MENU** key to return to the recall window (a) (Figure 7-2).
6. Press the **RECALL** key to return to the main interface.

7.5 ECG Copy

In the **AUTO** mode, once the hint information *COPY* appears on the LCD screen, pressing the **1mV/Copy** key can print the ECG report which was printed out last time. Pressing the **PRINT/STOP** key can stop printing the ECG report.

Note: After an ECG report is printed out in the AUTO mode, if you change the printing mode or the printing format, the ECG report can not be printed again by pressing the **1mV/Copy** key.

Chapter 8 Settings (SE-3 Wide Screen)

Press the **MENU** key to open the system setup interface.

1. Press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to select the **LOGIN**, **RECORD**, **GENERAL**, or **SYSTEM** tab.
2. Press the Up or Down arrow to select an item. Then press the Left or Right arrow to set the item. Press the **MENU** key to confirm.
3. For details on entering information about patient and doctor, please refer to section 6.1, "Entering Patient Information".

8.1 Login Settings

Press the **MENU** key to open the system setup interface. Press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to select the **LOGIN** tab.

On the login setting interface, you can edit patient information.

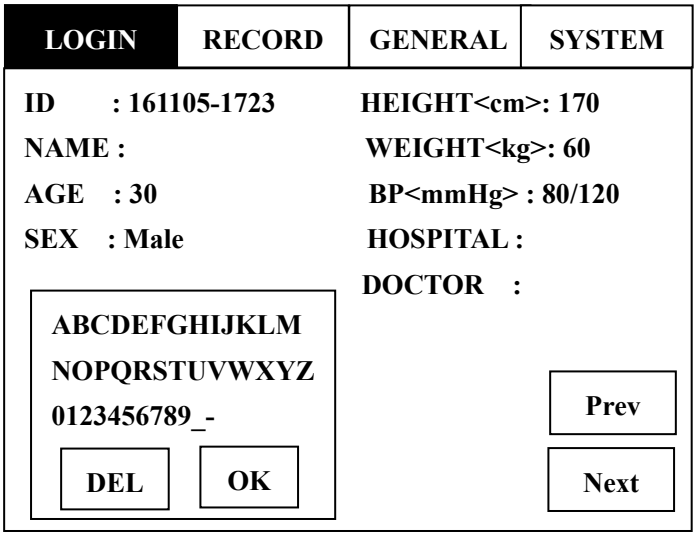


Figure 8-1 Login Setting Interface

Note: The patient information can not be set or changed during the printing course.

ID : Patient ID HEIGHT<cm>: Patient Height (Range: 0~255)

NAME : Patient Name (Within 11 characters) WEIGHT<kg>: Patient Weight (Range: 0~255)

AGE : Patient Age (Range: 0~99)

BP<mmHg>: Patient Systolic Pressure/Diastolic Pressure (Range: 0~350)

SEX : Patient Gender (Male/Female) HOSPITAL: Hospital Name

DOCTOR: Doctor Name

For the detailed information of entering patient information, please refer to section 6.1, "Entering Patient Information".

8.2 Recording Settings

Press the **MENU** key to open the system setup interface. Press the Up or Down arrow to select the **Prev** or **Next** button, and then press the Left or Right arrow to select the **RECORD** tab.

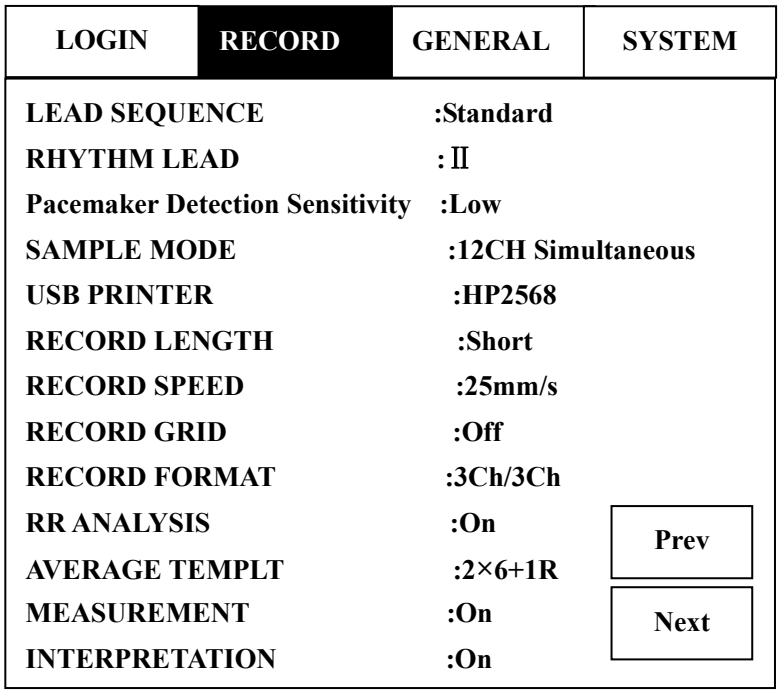


Figure 8-2 Record Setting Interface

8.2.1 Lead Settings

LEAD SEQUENCE: Standard/Cabrera

Lead Sequence	Lead group 1	Lead group 2	Lead group 3	Lead group 4
Standard	I, II, III	aVR, aVL, aVF	V1, V2, V3	V4, V5, V6
Cabrera	aVL, I, -aVR	II, aVF, III	V1, V2, V3	V4, V5, V6

RHYTHM LEAD:

The rhythm lead can be one of the 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, and V6.

8.2.2 Pacemaker Detection Sensitivity Settings (Optional, with DE12 ECG Board)

When the **Pacemaker Detection Sensitivity** item is set to **High**, the pacemaker signal is easy to be detected.

When the **Pacemaker Detection Sensitivity** item is set to **Low**, the pacemaker signal is hard to be detected.

Note: For details about the detectable parameter ranges, please refer to A1.5, "Performance Specifications".

8.2.3 Sampling Mode Settings

1CH Sequential:

ECG signals of a lead are sampled one by one in a certain sequence.

3CH Sequential:

ECG signals of a lead group are sampled one by one in a certain sequence.

12CH Simultaneous:

ECG signals of all leads are sampled simultaneously.

8.2.4 USB Printer Settings

You can set the **USB PRINTER** to **HP Deskjet D2468**, **HP Deskjet D5568**, **HP Deskjet D2668**, **HP Deskjet D4368** or **HP Laserjet P2035**. **HP Deskjet D2668** is the initial setting. In the USBPRT mode, when an option is selected, you should connect the corresponding USB printer to USB Socket of the electrocardiograph with a special cable, and then printing can be carried out.

Options	Corresponding USB Printers
HP Deskjet D2468	HP Deskjet D2468
	HP Deskjet 3938
	HP Deskjet D2368
HP Deskjet D5568	HP Deskjet D2568
	HP Deskjet D5568
HP Deskjet D2668	HP Deskjet D2668
HP Deskjet D4368	HP Deskjet D4368
HP Laserjet P2035	HP Laserjet P2015
	HP Laserjet P2035

Note:

1. Make sure that paper has been installed in USB printer before printing. NO Paper may results in error.
2. You should connect the USB printer Cable after power-on, and pull out the USB printer Cable before power-off for protecting the USB printer.

CAUTION

It is forbidden to frequently insert and pull out U disk or USB printer after power-on.

8.2.5 Recording Settings

RECORD LENGTH : Short

RECORD FORMAT : 3Ch/3Ch

RECORD SPEED : 25 mm/s

Take the above settings as an example, the recording speed is 25mm/s, and the recording length of each lead group is in short form.

RECORD LENGTH

When **RECORD LENGTH** is set to **Short,** ECG waves of each lead group will be printed for about 2.5 seconds.

When **RECORD LENGTH** is set to **Medium,** ECG waves of each lead group will be printed for about 5 seconds.

When **RECORD LENGTH** is set to **Long**, ECG waves of each lead group will be printed for about 7.5 seconds.

When **RECORD LENGTH** is set to **Longest**, ECG waves of each lead group will be printed for about 10 seconds.

RECORD SPEED

In the **MANUAL/RHYTHM** mode, **RECORD SPEED** can be set to **5 mm/s**, **6.25 mm/s**, **10 mm/s**, **12.5 mm/s**, **25 mm/s** or **50 mm/s**.

In the **AUTO/OFF/USBPRT** mode, **RECORD SPEED** can be set to **25 mm/s** or **50 mm/s**.

RECORD GRID

When **RECORD GRID** is set to **On**, the dashed grids which are 5 mm by 5 mm will be printed on the recorder paper.

When **RECORD GRID** is set to **Off**, dashed grids will not be printed on the recorder paper.

RECORD FORMAT

When **RECORD FORMAT** is set to **3Ch/3Ch**, ECG waves of all leads will be printed in 4 groups of 3.

When **RECORD FORMAT** is set to **3Ch/2Ch**, ECG waves of lead I, II, III, aVR, aVL and aVF will be printed in 2 groups of 3, and ECG waves of lead V1, V2, V3, V4, V5 and V6 will be printed in 3 groups of 2.

When **RECORD FORMAT** is set to **1Ch+1R**, ECG waves of all leads will be printed one by one in a sequence, with ECG waves of one rhythm lead on the bottom of the ECG reports.

When **RECORD FORMAT** is set to **1Ch**, ECG waves of all leads will be printed one by one in a sequence.

When **RECORD FORMAT** is set to **3Ch+1R**, ECG waves of all leads will be printed in 4 groups of 3, with one rhythm lead on the bottom of the ECG reports.

RR ANALYSIS

When **RR ANALYSIS** is set to **On**, RR analysis results, including RR interval measurement information, RR histogram and RR trend chart, will be printed in the **RHYTHM** mode.

When **RR ANALYSIS** is set to **Off**, there will be no RR analysis results printed out in the **RHYTHM** mode.

AVERAGE TEMPLT

When **AVERAGE TEMPLT** is set to **2×6+1R** or **4×3**, average template will be printed in the format of **2×6+1R** or **4×3**.

The format of **2×6+1R** means that ECG waves of all leads are printed in 2 groups of 6, with one rhythm lead at the bottom during the entire 10-second printing course.

The format of **4×3** means that ECG waves of all leads are printed in 4 groups of 3 during the entire 10-second printing course.

When **AVERAGE TEMPLT** is set to **Off**, there will be no average template in the ECG report.

8.2.6 Measurement and Interpretation

The measurement function provides the automatic measurement of these common parameters, such as heart rate, P-R interval, QRS complex duration, Q-T interval, P/QRS/T axis, RV5/SV1 amplitude etc. The interpretation function provides the automatic diagnosis of hundreds of abnormal cases, such as Arrhythmia, AV block, ventricular conduction block, myocardial infarction, ventricular hypertrophy and atria enlargement, ST-T abnormality and electrical axes deviation.

MEASUREMENT

When **MEASUREMENT** is set to **On**, the measurement information will be printed in the **AUTO** mode.

When **MEASUREMENT** is set to **Off**, there will be no measurement information printed.

INTERPRETATION

When **INTERPRETATION** is set to **On**, the interpretation information will be printed.

When **INTERPRETATION** is set to **Off**, there will be no interpretation information printed.

Note: For details on the printed measurement and interpretation information, please refer to section 6.4, “ECG Reports”.

8.2.7 Parameter Options

In the following option column, the double-underlined values are default settings.

No.	Items	Options
1	LEAD SEQUENCE	Standard, Cabrera
2	RHYTHM LEAD	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
3	Pacemaker Detection Sensitivity(optional, with DE12 ECG board)	Low, High
3	SAMPLE MODE	1CH Sequential, 3CH Sequential, 12CH Simultaneous
4	USB PRINTER	HP2468, HP2568, HP4368, HP2015
5	RECORD LENGTH	Short, Medium, Long, Longest
6	RECORD SPEED	25mm/s, 50mm/s, 5mm/s, 6.25mm/s, 10 mm/s, 12.5mm/s
7	RECORD GRID	Off, On
8	RECORD FORMAT	3Ch/3Ch, 3Ch/2Ch, 1Ch+1R, 1Ch, 3Ch+1R
9	RR ANALYSIS	Off, On
10	AVERAGE TEMPLT	2×6+1R, Off, 4×3
11	MEASUREMENT	Off, On
12	INTERPRETATION	Off, On

8.3 General Settings

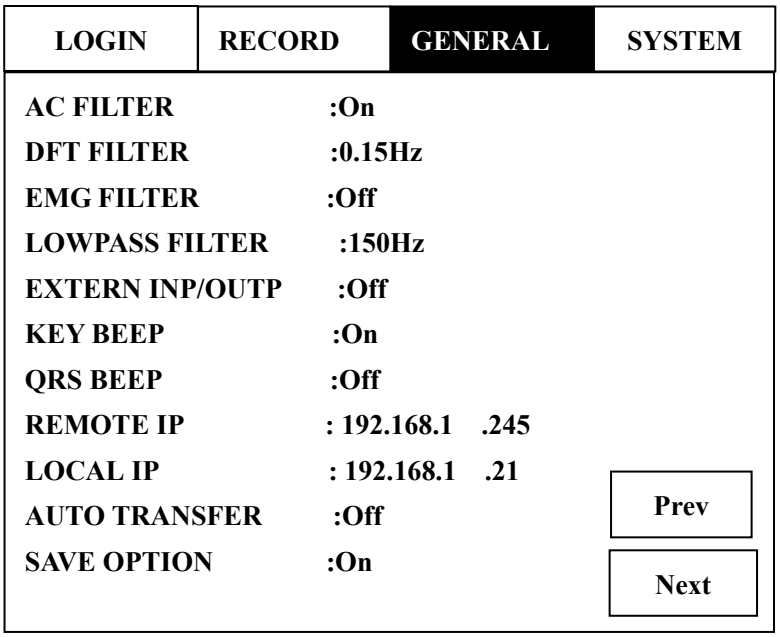


Figure 8-3 General Setting Interface

8.3.1 Filter Settings

AC FILTER

AC filter suppresses AC interference without attenuating or distorting the ECG. There are two options: **On** and **Off**.

DFT FILTER

DFT filter greatly reduces the baseline fluctuations without affecting ECG signals. The purpose of this filter is to keep the ECG signals on the baseline of the printout. The set value is the low limit of the frequency range, including **0.05Hz**, **0.15Hz**, **0.25Hz**, **0.32Hz**, **0.5Hz and 0.67Hz**. **DFT FILTER** is normally set to **0.67Hz**.

EMG FILTER

EMG filter suppresses disturbances caused by strong muscle tremors. The cutoff frequency can be set to **25Hz**, **35Hz** or **45Hz**. Select **Off** to turn off the function.

LOWPASS FILTER

Lowpass filter restricts the bandwidth of input signals. The cutoff frequency can be set to **150Hz**, **100Hz** or **75Hz**. All the input signals whose frequency is higher than the setting cutoff frequency will be attenuated.

Note: Only when EMG Filter is set to Off, can the set Lowpass Filter be effective.

8.3.2 External Input/Output Settings

External input/output signal interface is equipped in SE-3, through which SE-3 can receive ECG signals from external equipment, and transmit ECG signals to external equipment. There are two options: **On** and **Off**.

8.3.3 Key Beep & QRS Beep Settings

KEY BEEP Setting

When **KEY BEEP** is set to **On**, there is a short beep when the keys on the control panel are pressed.

When **KEY BEEP** is set to **Off**, there is no sound when these keys are pressed.

QRS BEEP Setting

When **QRS BEEP** is set to **On**, there is a short beep when an R wave is detected.

When **QRS BEEP** is set to **Off**, there is no sound when an R wave is detected.

8.3.4 IP Settings (Optional, Only for Net Type)

REMOTE IP

IP address of the remote computer which receives ECG data from SE-3 through net.

LOCAL IP

IP address of SE-3

8.3.5 Save Option Settings

When **SAVE OPTION** is set to **On**, the ECG data will be saved into the recall window automatically when ECG reports are printed in the **AUTO** mode.

When **SAVE OPTION** is set to **Off**, the ECG data will not be saved into the recall window when ECG reports are printed in the **AUTO** mode.

Note: When there is no space for more records to be stored in the recall window, the message *MemFull* is displayed.

8.3.6 Transmission Settings

Note: To transmit ECG data to the PC, Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before the transmission.

When **AUTO TRANSFER** is set to **OFF**, the patient records can not be transmitted.

When **AUTO TRANSFER** is set to **UART AUTO**, firstly connect the serial port of the PC to the RS232 socket of SE-3 with the serial cable recommended by the manufacturer. Then open the Smart ECG Viewer software in the PC. In the **AUTO** or **OFF** mode, ECG data can be transmitted through UART port automatically after ECG reports are printed.

When **AUTO TRANSFER** is set to **Net AUTO** (optional, only for Net type), firstly connect the net interface of the PC to the net interface of SE-3 with an Ethernet cable recommended by the manufacturer. Secondly open the Smart ECG Viewer software in the PC. Then set the **REMOTE IP** and **LOCAL IP** item on the system setup interface of SE-3. In the **AUTO** or **OFF** mode, ECG data can be transmitted through net automatically after ECG reports are printed.

Note: During the course of data transmission and storage, if the power supply is suddenly cut off, the file system error may arise in the electrocardiograph. After the error information is displayed, you should format the file system.

8.3.7 Parameter Options

In the following option column, the double-underlined values are default settings.

No.	Items	Options
1	AC FILTER	On, Off
2	DFT FILTER	0.05Hz, 0.15Hz, 0.25Hz, 0.32Hz, 0.5Hz and 0.67Hz
3	EMG FILTER	OFF, 45Hz, 35Hz, 25Hz
4	LOWPASS FILTER	150Hz, 100Hz, 75Hz
5	EXTERN INPUT/OUTPUT	On, Off
6	KEY BEEP	On, Off
7	QRS BEEP	On, Off
8	AUTO TRANSFER	Off, UART AUTO, Net AUTO (Optional, only for Net type)
9	SAVE OPTION	On, Off

8.4 System Settings

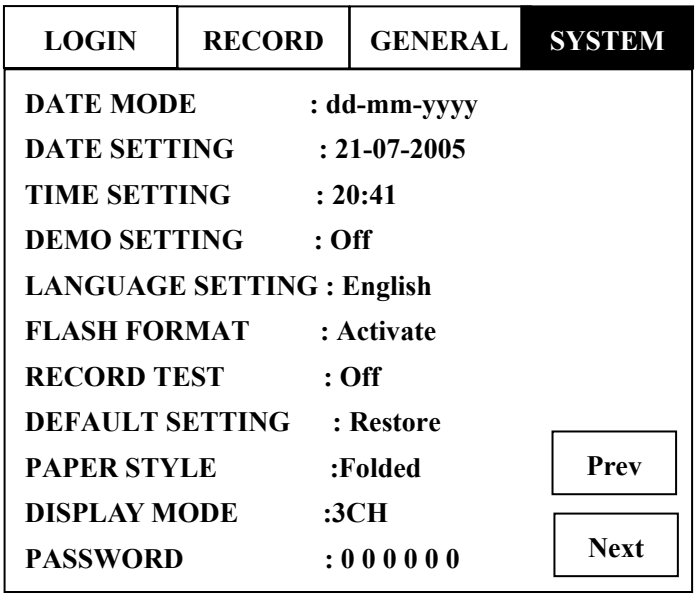
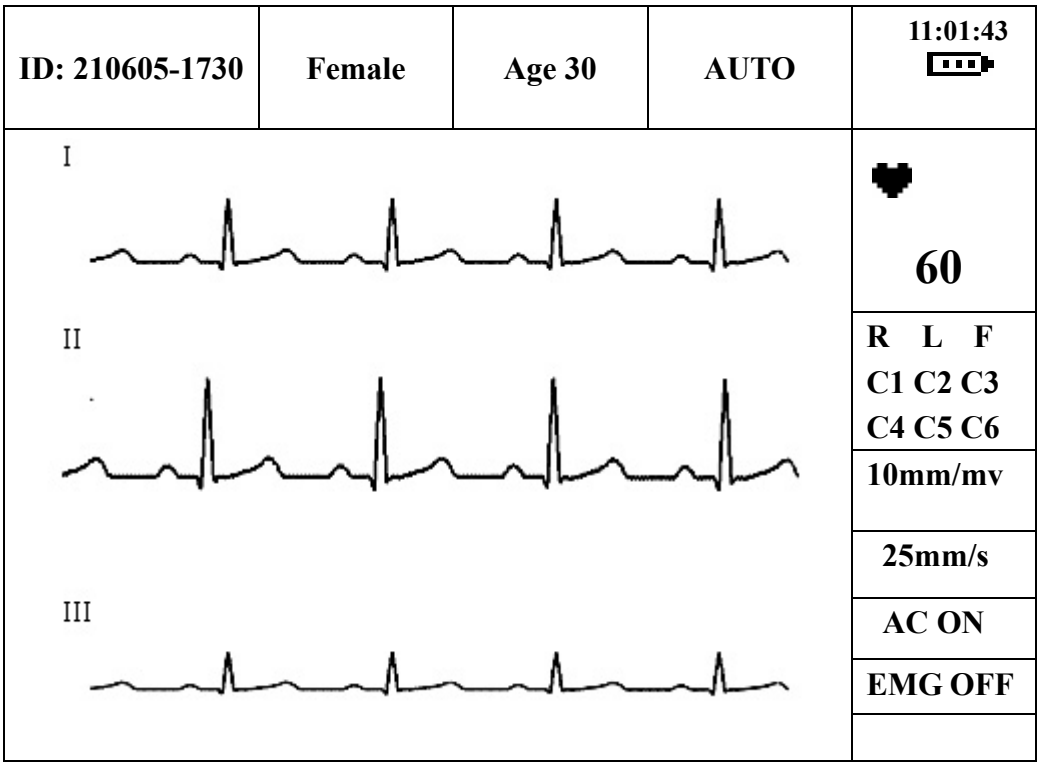


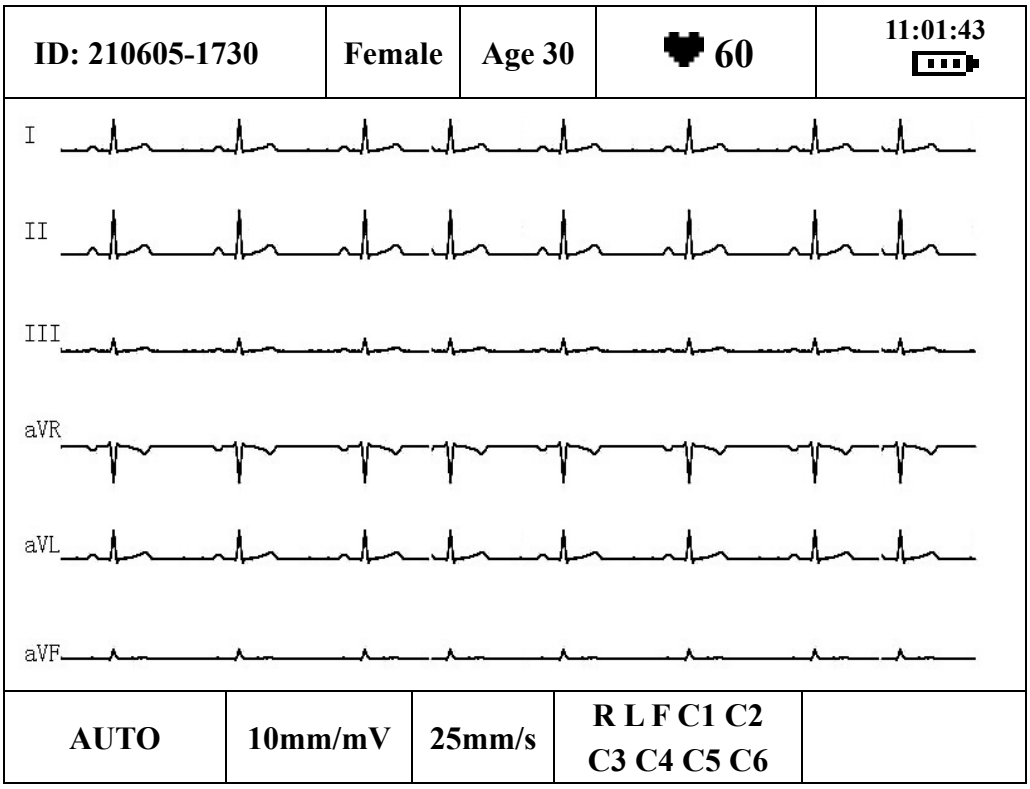
Figure 8-4 System Setting Interface

8.4.1 Display Mode Settings

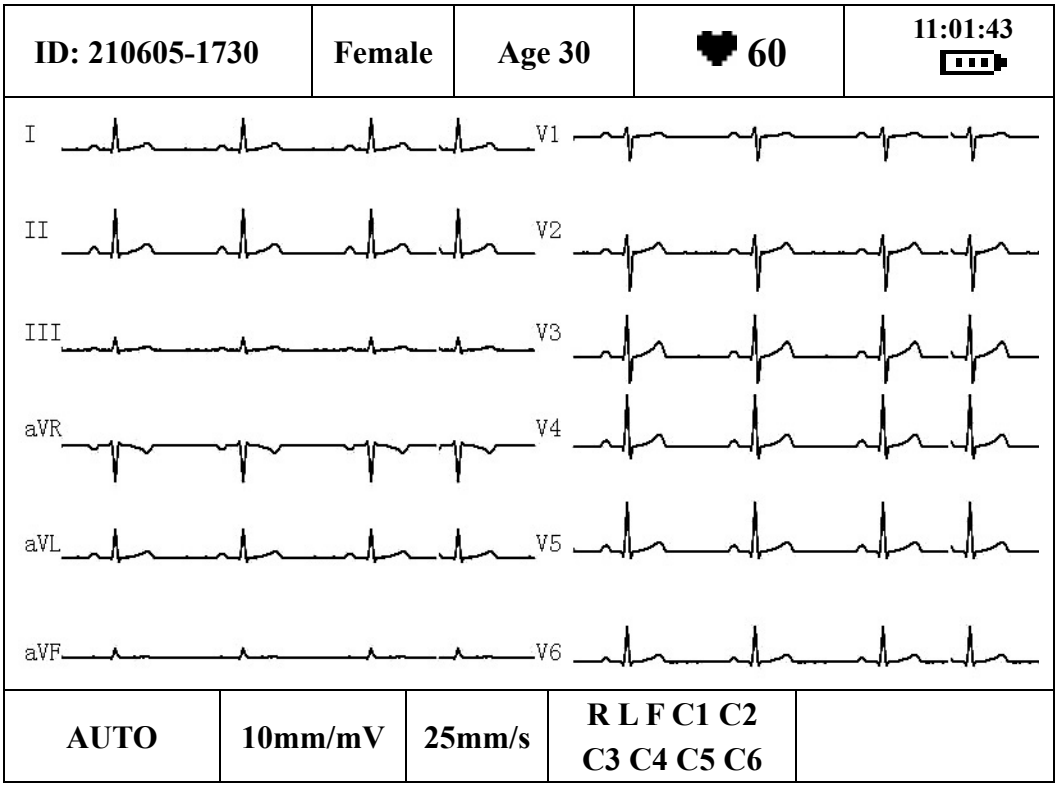
Three display modes can be selected: 3CH, 6CH and 12CH. The display interfaces are shown as follows.



3CH Display Mode



6CH Display Mode



12CH Display Mode

DATE MODE: DATE MODE can be set to **dd-mm-yyyy**, **mm-dd-yyyy** or **yyyy-mm-dd**. The current date will be displayed in the selected format after setup.

DATE&TIME SETTING: Set the current date and time. It will be printed in the ECG reports.

Note: Please set DATE&TIME correctly when it's the first time you use the electrocardiograph.

WARNING

We recommend that the electrocardiograph should be working on AC power supply at least 8 hours per month to avoid DATE&TIME missing.

DEMO SETTING: Select **On** to enter the demo mode.

LANGUAGE SETTING: You can set the system language.

FLASH FORMAT: Set **FLASH FORMAT** to **Activate**, the warning message *Do you really want to format the file system?* will pop up. Then press the **RECALL** key to format the file system; or press the **PRINT/STOP** key to cancel the operation.

RECORD TEST: After the recorder paper is loaded, press the Left or Right arrow to start the printing test. Then the triangle wave in effective paper width will be printed. The status of print head can be estimated from this triangle wave. Press the Left or Right arrow again to stop the printing test.

DEFAULT SETTING: Select **Restore** to restore the default settings.

Note: In the parameter option column, there is no underlined option for a certain parameter, which means there is no default value for the parameter. When you restore default settings, the parameter will not change.

PAPER STYLE: Recorder paper style. The rolled thermal paper or the folded thermal paper can be selected as recorder paper.

Note: If you set **PAPER STYLE** to **Folded**, when printing reports in the **Auto** or **RHYTHM** mode, printing will not stop until a black sign is met.

PASSWORD: Password for entering the advanced control interface

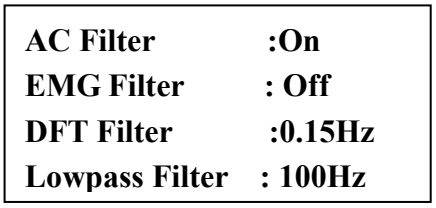
8.4.2 Parameter Options

In the following option column, the double-underlined values are default settings.

No.	Items	Options
1	DATE MODE	dd-mm-yyyy, mm-dd-yyyy, yyyy-mm-dd
2	RECORD TEST	Testing, Off
3	DEFAULT SETTING	Restore
4	PAPER STYLE	Folded, Rolled
5	DISPLAY MODE	3CH, 6CH, 12CH

Chapter 9 Settings (SE-3 Narrow Screen)

Note: The common settings of SE-3 Narrow screen and SE-3 Wide screen have common functions. Please refer to the function explanation of SE-3 Wide screen.



192×64 dot single color LCD Screen

Press the Up or Down arrow to select an item, and then press the Left or Right arrow to set the item.

Press the Lead switch key to switch to the prev or next page of the system setup interface.

The setting items on the system setup interface of SE-3 Narrow screen are as follows:

No.	Items	Explanation
1	AC Filter	Refer to Section 8.3.1
2	EMG Filter	
3	DFT Filter	
4	Lowpass Filter	
5	Record Format	Refer to Section 8.2.5
6	Record Grid	
7	Record Speed	
8	Record Length	
9	Average Template	
10	Measurement	Refer to Section 8.2.6
11	Interpretation	
12	RR Analysis	Refer to Section 8.2.5
13	Lead Sequence	Refer to Section 8.2.1
14	Sample Mode	Refer to Section 8.2.3
15	Rhythm Lead	Refer to Section 8.2.1

16	Paper Style	Refer to Section 8.4
17	Save Option	Refer to Section 8.3.5
18	Auto Transfer	Refer to Section 8.3.6
19	Local IP (optional, only for net type)	Refer to Section 8.3.4
20	Remote IP (optional, only for net type)	
21	Key Beep	Refer to Section 8.3.3
22	QRS Beep	
23	Extern Inp/Outp	Refer to Section 8.3.2
24	Record Test	Refer to Section 8.4
25	Demo Setting	
26	Language Setting	
27	Flash Format	
28	Default Setting	
29	Date Mode	
30	Date Setting	
31	Time Setting	
32	ID	Refer to Section 8.1
33	Password	Password for entering the advanced control interface
34	Pacemaker Detection Sensitivity (Optional, with DE12 ECG board)	Refer to Section 8.2.2
35	USB printer	Refer to Section 8.2.4

Chapter 10 Switching off the Electrocardiograph

When the built-in battery is used, press the **ON/OFF** key directly to turn off the unit.

When the mains supply is used, press the **ON/OFF** key, and then press the mains switch on the left side of the unit. Pull out the plug from the outlet.

Note: When switching off the device, please follow the above sequence strictly, or else there will be something wrong on the screen.

Chapter 11 Hint Information

Hint information will be displayed in the bottom right corner of the LCD screen when there is something wrong. Hint information provided by SE-3 and the corresponding causes are listed in Table 11-1.

Table 11-1 Hint Information and Causes

Hint Information	**Causes**
Lead off	Electrodes fall off the patient or the patient cable falls off the unit.
BAT WEAK	The built-in battery is weak.
Paper?	Recorder paper runs out or is not loaded.
PaperErr	The system doesn't detect any black signs while the paper style is set as "Folded" on the system setup interface.
Sampling/Printing	The system is sampling ECG signals or printing ECG reports.
Modu Err	There is something wrong with the ECG board.
Demo	The system is in the demonstration mode.
Copy	The ECG report printed last time is ready to be reprinted.
Process	The system is processing ECG data.
Transfer	The system is transmitting ECG records through the UART port or Ethernet.
MemFull	There is no space for saving more records.
Overload	The direct current voltage on an electrode is too high.
Uprinter	A USB printer is connected to the USB interface.
USBExist	A U disk is connected to the USB interface.

Chapter 12 Troubleshooting

1. Operating Problems

Q1: I want to save the ECG data without any printing, could it be possible?

A1: Yes, in the **OFF** mode, set **AVERAGE TEMPLT**, **MEASUREMENT** and **INTERPRETATION** to **Off** on the **RECORD** interface, and then return to the main interface, and press **PRINT/STOP** to activate the sampling. The ECG data will be collected and saved without printing. In the same way, if the transmission settings have been configured, the ECG data could be transmitted to the PC without printing.

2. Printing Problems

Q1: There was double impression in printing when I printed ECG reports by using an ink-jet printer. What's wrong with it?

A1: It may be the result of the coexisting black and color ink cartridges. Taking out the color ink cartridge may solve the problem.

Q2: I was encountered with paper-jam, what was I supposed to do?
A2: If it happened for the first time, it might be the result of an inappropriate placement of the paper. In this case, please open the paper casing, pull the paper out of the paper tray, tear the pages with rumples, and then put the paper in the paper tray again, adjust the position of the paper carefully and close the casing.

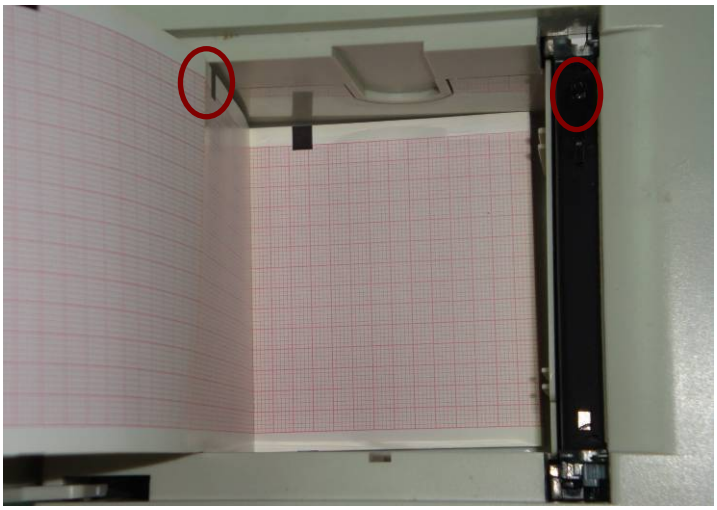
If the above-mentioned situation is not applicable, there might be some problem with the printing module. Please contact the manufacturer or the local distributor for further disposal.

Q3: The hint PaperErr is displayed on the screen, what should I do?
A3: It might be the result of unsuccessful detection of the black markers, first open the paper casing so as to clear the error information, and then check whether the black marker is on the top of the paper. Reload the paper in the paper tray. If it doesn't work, change the paper.

If the problem still exists, please contact the manufacturer or the local distributor for further disposal.

Q4: The hint *Paper?* is displayed on the screen, what should I do?

A4: Check whether the paper runs out, or the black marker is just facing the black maker detection window on the thermal printing head, as the following figure shows.



Reload the paper in the paper tray, close the paper casing firmly. If the problem still exists, please contact the manufacturer or the local distributor for further disposal.

Q5: I pressed the **PRINT/STOP** key, but the ECG didn't start printing, what's wrong with it?

A5: Please check whether there is any error information displayed on the screen.

If the hint *Paper?* or *PaperErr* is shown on the screen, please deal with it according to the above-mentioned measures.

If the hint *Transfer* is shown on the screen, which means that the ECG is transmitting the data to the PC, please wait a few seconds. You can start the printing after the data has been transmitted.

If the problem still exists, please contact the manufacturer or the local distributor for further disposal.

3. Transmitting Problems

Q1: The ECG doesn't respond to any keys after a long time of transmitting. It transmits nothing for there is no new data appearing on the interface of the PC software. What should I do?

A1: Some error may occur during the transmission course, for example, the connection between the ECG and the net cable may loosen. In this case, please restart the ECG. If it doesn't work, please restart the PC.

If the problem still exists, please contact the manufacturer or the local distributor for further disposal.

4. Main Unit Problems

Q1: I was doing the examination when the machine suddenly gave out a sound and displayed the hint *Lead Off*. What should I do?

A1: The leads are not connected well. Please check whether the electrodes are connected to the patient skin well, and then make sure that the patient cable socket is connected to the patient cable firmly.

If none of the above-mentioned measures take effect, please contact the manufacturer or the local distributor for further disposal.

Chapter 13 Cleaning, Care and Maintenance

13.1 Cleaning

CAUTION

Turn off the power before cleaning and disinfection. The mains supply must be switched off if it is in use.

13.1.1 Cleaning the Main Unit and the Patient Cable

The surfaces of the main unit and the patient cable can be wiped with a clean soft cloth damped in soapy water or non-caustic neutral detergent. After that, remove detergent remainder with a clean dry cloth.

13.1.2 Cleaning the Electrodes

Remove the remainder gel from the electrodes with a clean soft cloth first. Take suction bulbs and metal cups of chest electrodes apart, and take clamps and metal parts of the limb electrodes apart. Clean them in warm water and make sure there is no remainder gel. Dry the electrodes with a clean dry cloth or air dry naturally.

13.1.3 Cleaning the Print Head

Dirty and soiled thermal print head will deteriorate the printing definition. So it should be cleaned at least once a month regularly.

Open the recorder casing and remove the recorder paper. Wipe the print head gently with a clean soft cloth damped in 75% alcohol. For stubborn stain, soak it with a little alcohol first and wipe it off with a clean soft cloth. After air dried, load the recorder paper and shut the recorder casing.

CAUTION

1. Prevent the detergent from seeping into the main unit while cleaning. Do not immerse the unit or the patient cable into liquid under any circumstances.
2. Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.

13.2 Disinfection

To avoid permanent damage to the equipment, disinfection can be performed only when it is considered as necessary according to your hospital's regulations.

Before disinfection, clean the equipment first. Then wipe the surfaces of the unit and the patient cable with hospital standard disinfectant.

Note: Clean and disinfect the chest and limb electrodes after each use.

CAUTION

Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

13.3 Care and Maintenance

13.3.1 Recharge and Replacement of Battery

1) Capacity Identification

Current capacity of the rechargeable battery can be identified according to the battery symbol in the top right corner of the LCD screen.

: Full capacity

: Capacity is limited, and recharge should be taken into account.

: Capacity is low, and hint information *BAT WEAK* will be displayed on the LCD screen. The battery should be recharged immediately.

2) Recharge

SE-3 is equipped with the recharge control circuit together with the built-in rechargeable lithium battery. When the unit is connected to the mains supply, the battery will be recharged automatically. Then the battery recharging indicator lamp (→▭) and the mains supply indicator lamp (∿) will be lit at the same time. During the recharging course, the symbol flashes in the top right corner of the LCD screen. When the battery capacity is full, the symbol stops flashing, and the battery recharging indicator lamp (→▭) is black. When the 3-channel electrocardiograph is switched off, the battery recharging indicator lamp (→▭) is black if the battery is fully recharged.

Because of the capacity consumption during the storage and transport course, the battery capacity is not full when it is used for the first time. Battery recharge should be considered before the first use.

Note: If the battery has not been used for more than two months, it should be recharged before use.

3) Replacement

When the useful life of the battery is over, or foul smell and leakage are found, please contact the manufacturer or the local distributor for replacement.

WARNING

1. Only qualified service engineer authorized by the manufacturer can open the battery compartment and replace the battery, and the battery of the same model and specification provided by the manufacturer must be used.
2. Danger of explosion -- Do not reverse the anode and the cathode when installing the battery.
3. Remove the battery from the electrocardiograph when the electrocardiograph is not used for a long time.
4. If the battery is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.
5. When the battery's useful life is over, contact the manufacturer or the local distributor for disposal or dispose of the battery according to local regulations.

13.3.2 Recorder Paper

Note: Recorder paper provided by the manufacturer should be used. Other paper may shorten the life of the thermal print head. And the deteriorated print head may lead to illegible ECG reports and block the advance of paper.

Storage Requirements:

- Recorder paper should be stored in a dry, dark and cool area, avoiding excessive temperature, humidity and sunshine.
- Do not put the recorder paper under fluorescence for a long time.
- Make sure that there is no polyvinyl chloride or other chemicals in the storage environment, which will lead to color change of the paper.
- Do not overlap the recorded paper for a long time, or else the ECG reports may trans-print each other.

13.3.3 Maintenance of the Main Unit, the Patient Cable and Electrodes

The following safety checks should be performed at least every 24 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

a) Inspect the equipment and accessories for mechanical and functional damage.

b) Inspect the safety related labels for legibility.

c) Inspect the fuse to verify compliance with rated current and breaking characteristics.

d) Verify the device functions properly as described in the instructions for use.

e) Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1ohm.

f) Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500 μA, SFC 1000μA.

g) Test the enclosure leakage current according to IEC/EN 60601-1: Limit: NC 100μA, SFC 500μA.

h) Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

i) Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

j) Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50μA (CF)

The leakage current should never exceed the limit. The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the above tests, the device has to be repaired.

WARNING

Failure on the part of the responsible individual hospital or institution employing this equipment to implement a satisfactory maintenance schedule may cause undue equipment failures and possible health hazards.

1) Main Unit

- Avoid excessive temperature, sunshine, humidity or dirt.
- Put the dustproof coat on the main unit after use and prevent shaking it violently when moving it to another place.

- Prevent any liquid from seeping into the equipment, otherwise the safety and performance of the electrocardiograph can not be guaranteed.

2) Patient Cable

- Integrity of the patient cable, including the main cable and lead wires, should be checked regularly. Make sure that it is conductible.
- Do not drag or twist the patient cable with excessive stress while using it. Hold the connector plug instead of the cable when connecting or disconnecting the patient cable.
- Align the patient cable to avoid twisting, knotting or crooking in a closed angle while using it.
- Store the lead wires in a big wheel to prevent any people from stumbling.
- Once damage or aging of the patient cable is found, replace it with a new one immediately.

3) Electrodes

- Electrodes must be cleansed after use and make sure there is no remainder gel on them.
- Keep suction bulbs of chest electrodes away from sunshine and excessive temperature.
- After long-term use, the surfaces of electrodes will be oxidized because of erosion and other causes. By this time, electrodes should be replaced to achieve high-quality ECG records.

CAUTION

The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.

Chapter 14 Accessories

WARNING

Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.

Table 14-1 Accessory List

No.	Accessory	Part Number
1	Power cord (European)	01.13.36014
2	Power cord (American)	11.13.36015
3	Patient cable (ϕ4mm, banana connector, IEC)	01.57.471016
4	Patient cable (ϕ4mm, banana connector, AHA)	01.57.471017-11
5	Adult Precordial Suction Electrodes (6 PCS/set, match ϕ4mm Patient cable)	01.57.040163
6	Adult Limb Clamp Electrodes (4 PCS/set, match ϕ4mm Patient cable)	01.57.040162-11
7	Snap/Banana Socket Adapters (10 PCS/set, match ϕ4mm Patient cable)	01.13.107449
8	Adult Disposable Adhesive Electrodes (1 piece)	11.57.040159
9	Electrode Cream (65ml)	11.25.78047
10	Paper roller	11.51.19993
11	Recorder Paper (Roll, 80mm×20m)	01.57.78076
12	Recorder Paper (Z-fold, 80mm×70mm×200P)	01.57.78079
13	Ground Cable	11.13.114114
14	Input and Output Connection Cable	11.13.19907
15	ECG Carrying Bag	11.56.78042
16	Flash Disk (Kingston DT1G2, 2G, USB2.0 Protocol)	11.18.078204
17	External Ink-jet Printer (HP Deskjet D2668)	11.18.052215
18	Rolling Stand (MT-202)	03.28.107403
19	Wireless AP	11.17.047338

SE-3 and accessories are available by contacting the manufacturer or your local distributor.

Note：The Adult Precordial Suction Electrodes and Adult Limb Clamp Electrodes are not available in the U.S.

Chapter 15 Warranty and Service

15.1 Warranty

EDAN warrants that EDAN's products meet the labeled specifications of the products and will be free from defects in materials and workmanship that occur within warranty period.

The warranty is void in cases of:

a) damage caused by mishandling during shipping.
b) subsequent damage caused by improper use or maintenance.
c) damage caused by alteration or repair by anyone not authorized by EDAN.
d) damage caused by accidents.
e) replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is determined to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, EDAN will, at its discretion, repair or replace the defective part(s) free of charge. EDAN will not provide a substitute product for use when the defective product is being repaired.

15.2 Contact information

If you have any question about maintenance, technical specifications or malfunctions of devices, contact your local distributor.

Alternatively, you can send an email to EDAN service department at: support@edan.com.cn.

Appendix 1 Technical Specifications

A1.1 Safety Specifications

Comply with:		IEC/EN 60601-1+A1+A2, IEC/EN 60601-1-2+A1, IEC/EN60601-2-25, ANSI/AAMI EC11, IEC/EN 60601-2-51
Anti-electric-shock type:		Class I with internal power supply
Anti-electric-shock degree:		Type CF
Degree of protection against harmful ingress of water:		Ordinary equipment (Sealed equipment without liquid proof)
Disinfection/sterilization method:		Refer to the user manual for details
Degree of safety of application in the presence of flammable gas:		Equipment not suitable for use in the presence of flammable gas
Working mode:		Continuous operation
EMC:		Group I, Class A
Patient Leakage Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)
Patient Auxiliary Current:	NC	<10μA (AC) / <10μA (DC)
	SFC	<50μA (AC) / <50μA (DC)

A1.2 Environment Specifications

	Transport & Storage	Working
Temperature:	-20℃ (-4ºF) ~ +55℃ (+131ºF)	+5ºC (+41ºF) ~ +40ºC (+104ºF)
Relative Humidity:	25%~93% Non-Condensing	25%~80% Non-Condensing
Atmospheric Pressure:	700hPa ~1060hPa	860hPa ~1060hPa

A1.3 Physical Specifications

Dimensions	288mm×210mm×70mm (11.3in×8.3in×2.8in)
Weight	Approx. 2.5kg (5.5 lbs) (Excluding recorder paper and battery)
Display	320×240 dot single color LCD Screen or 192×64 dot single color LCD Screen

A1.4 Power Supply Specifications

Mains Supply:	Operating voltage =100V-115V~ / 220V-240V~
	Operating frequency = 50Hz / 60Hz
	input power = 35VA
Built-in Lithium Battery Pack:	Rated voltage = 14.8V
	Rated capacity = 2200mAh
	When the battery is fully charged, the 3-channel electrocardiograph can work normally about 6.5 hours. It can continuously record about 3 hours in Manual mode, and record 330 reports at most in the AUTO mode.
	Charge mode: Constant current/voltage
	Charge current (standard) = $0.28C_5A$ (600mA)
	Charge voltage (standard) = (16.8-0.1V)
	Necessary Charge time: 5 hours

	Cycle life ≥ 300 times
Power Consumption:	35VA (max)
Fuse:	T400mA 250V Ø5×20 / T200mA 250V Ø5×20

A1.5 Performance Specifications

Recording	
Recorder:	Thermal dot-matrix recorder
Printing Density	8 dots per mm / 200 dots per inch (amplitude axes) 40 dots per mm / 1000 dots per inch (time axes, @ 25 mm/s)
Recorder Paper:	Folded thermal paper, 80mm×70mm×200pages Rolled thermal paper, 80mm×20m
Effective Width:	72mm
Paper Speed:	5mm/s, 6.25mm/s, 10mm/s, 12.5mm/s, 25mm/s, 50mm/s (±3%)
Accuracy of data:	±5% (x-axis), ±5%(y-axis)
HR Recognition	
Technique:	Peak-Peak Detection
HR Range:	30 BPM ~ 300 BPM
Accuracy:	±1BPM
ECG Unit	
Leads:	Standard 12 leads
Acquisition Mode:	simultaneously 12 leads
A/D Resolution:	12bits / 24bits (optional, with DE12 ECG board)
Time Constant:	≥3.2s
Frequency Response:	0.05Hz ~ 150Hz (-3dB)
Sensitivity:	2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, AGC
Input Impedance:	≥50MΩ(10Hz)

Input Circuit Current:	≤0.05μA
Input Voltage Range	≤±5 mVpp
Calibration Voltage:	1mV±3%
DC Offset Voltage:	±500mV / ±600mV(optional, with DE12 ECG board)
Noise:	≤12.5μVp-p
Multi-channel Crosstalk	≤0.5mm
Filter	AC Filter: On / Off
	DFT Filter: 0.05Hz / 0.15Hz / 0.25Hz / 0.32Hz / 0.5Hz / 0.67Hz
	EMG Filter: 25Hz / 35Hz / 45Hz / OFF
	LOWPASS Filter:150Hz / 100Hz / 75Hz
CMRR	≥110dB / ≥115dB (optional, with DE12 ECG board)
Sampling Frequency	1000Hz
Pacemaker Detection (Optional, with DE12 ECG board)	
Amplitude	±2mV ~ ±700mV
Width	0.1ms ~ 2.0ms
Sampling Frequency	10,000/sec/channel
External Input/Output (Optional)	
Input	≥100kΩ; Sensitivity 10mm/V±5%; Single ended
Output	≤100Ω; Sensitivity 1V/mV±5%; Single ended

Note: Test the accuracy of input signal reproduction according to the methods described in clause 4.2.7.2 in ANSI/AAMI EC11:1991/(R)2001, and the result complies with the clause 3.2.7.2 in ANSI/AAMI EC11:1991/(R)2001.

Appendix 2 EMC Information

Guidance and manufacture's declaration - electromagnetic emissions- for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic emission		
The Electrocardiograph is intended for use in the electromagnetic environment specified below. The user of the Electrocardiograph should assure that it is used in such an environment.		
Emission test	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	The Electrocardiograph uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emission CISPR 11	Class A	The Electrocardiograph is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies building used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacture's declaration - electromagnetic immunity - for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic immunity			
The Electrocardiograph is intended for use in the electromagnetic environment specified below. The user of Electrocardiograph should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	It is recommended the use of antistatic materials. If floor are covered with synthetic material, the relative humidity should be at least 50%.
Electrical fast	±2 kV for power	±2 kV for power	It is recommended the use

transient/burst IEC 61000-4-4	supply lines	supply lines	of filters on power input lines and enough separation between signal lines and power lines.
Surge IEC 61000-4-5	±1 kV line to line ±2 kV line to ground	±1 kV line to line ±2 kV line to ground	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50Hz/60Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacture's declaration - electromagnetic immunity - for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

<table>
<tr><th colspan="4">Guidance and manufacture's declaration – electromagnetic immunity</th></tr>
<tr><td colspan="4">The Electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of Electrocardiograph should assure that it is used in such an environment.</td></tr>
<tr><th>Immunity test</th><th>IEC 60601 test level</th><th>Compliance level</th><th>Electromagnetic environment - guidance</th></tr>
<tr><td>Conducted RF
IEC/
61000-4-6

Radiated RF
IEC
61000-4-3</td><td>3 V_{rms}
150 kHz to 80 MHz

3 V/m
80 MHz to 2.5 GHz</td><td>3 V_{rms}

3 V/m</td><td>Portable and mobile RF communications equipment should be used no closer to any part of the electrocardiograph, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Recommended separation distance
$d = 1.2\sqrt{P}$

$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz

$d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz
Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).
Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b]
Interference may occur in the vicinity of equipment marked with the following symbol:
 </td></tr>
<tr><td colspan="4">NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</td></tr>
<tr><td colspan="4">[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic</td></tr>
</table>

environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Electrocardiograph is used exceeds the applicable RF compliance level above, the Electrocardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Electrocardiograph.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM - for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and electrocardiograph

The electrocardiograph is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the electrocardiograph can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the electrocardiograph as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{P}$	**800 MHz to 2.5 GHz** $d = 2.3\sqrt{P}$
0.01	**0.12**	**0.12**	**0.23**
0.1	**0.38**	**0.38**	**0.73**
1	**1.2**	**1.2**	**2.3**
10	**3.8**	**3.8**	**7.3**
100	**12**	**12**	**23**

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix 3 Abbreviation

Abbr	English
BP	Blood Pressure
ECG	Electrocardiogram/Electrocardiograph
HR	Heart Rate
aVF	Left Foot Augmented Lead
aVL	Left Arm Augmented Lead
aVR	Right Arm Augmented Lead
LA	Left Arm
LL	Left Leg
RA	Right Arm
RL	Right Leg
ID	Identification
AC	Alternating Current
USB	Universal Serial Bus
AGC	Auto Gain Control
Wireless AP	Wireless Access Point
NC	Normal Condition
SFC	Single Fault Condition

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